FIG. 1A

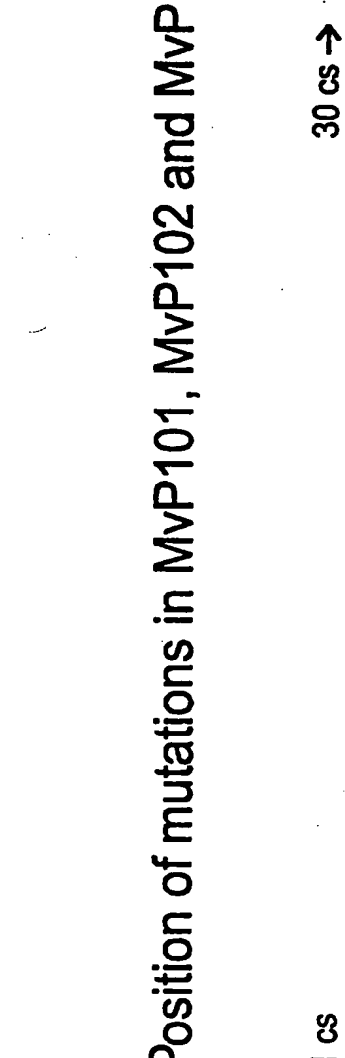


FIG. 1B

FIG. 1C

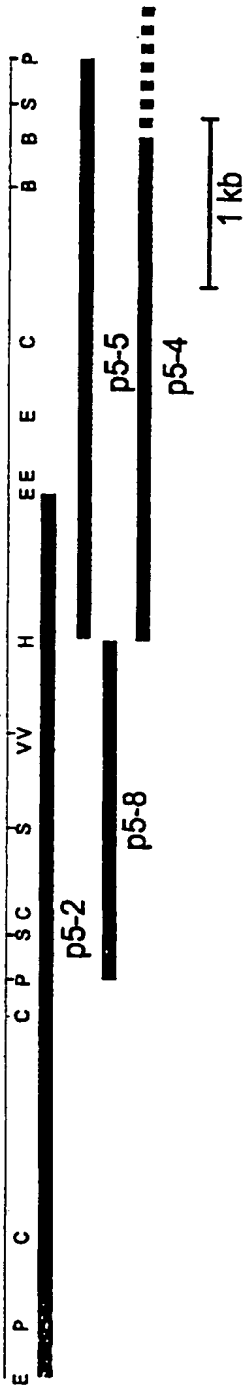


FIG. 2A

Alignment of SseB to EspA

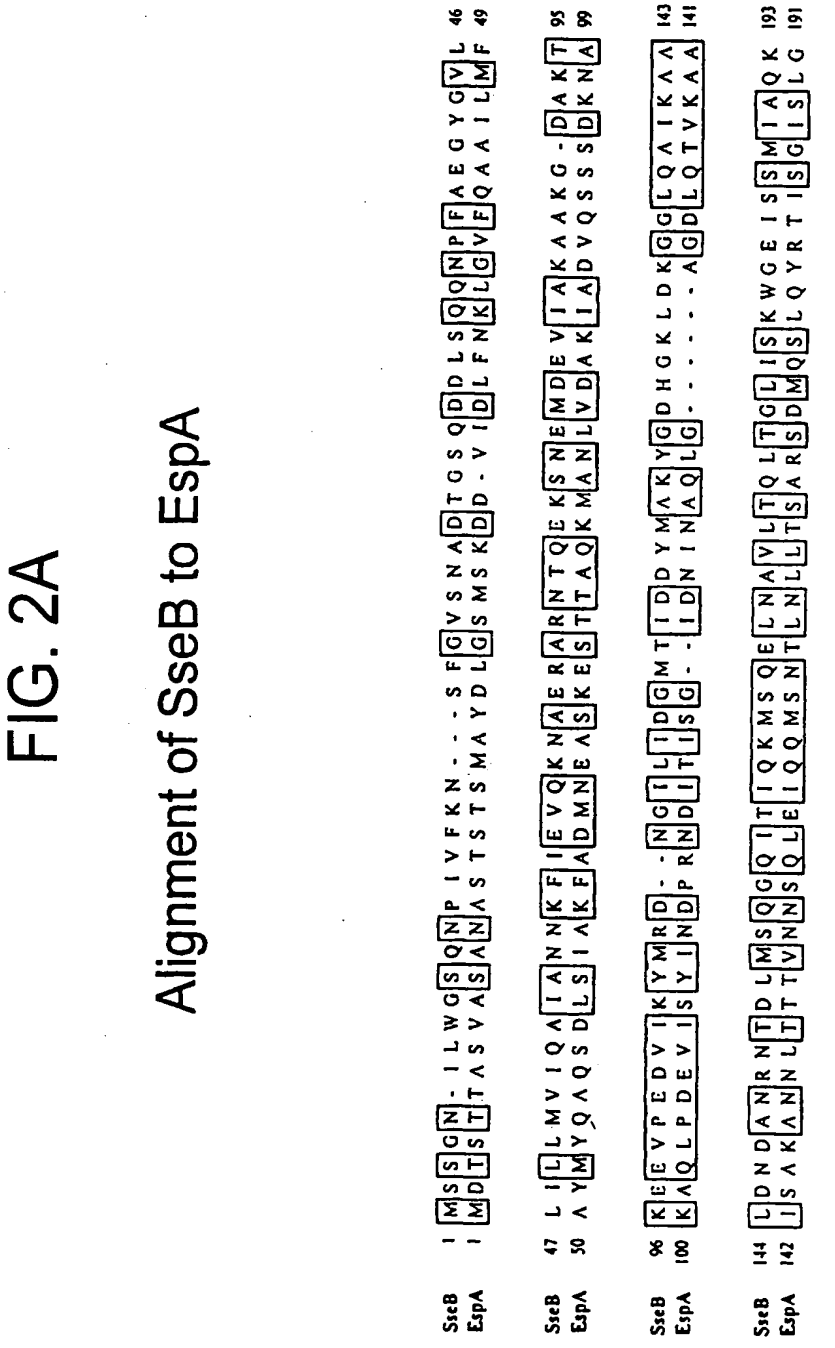


FIG. 2B

Alignment of SseC to EspD, YopB and PepB

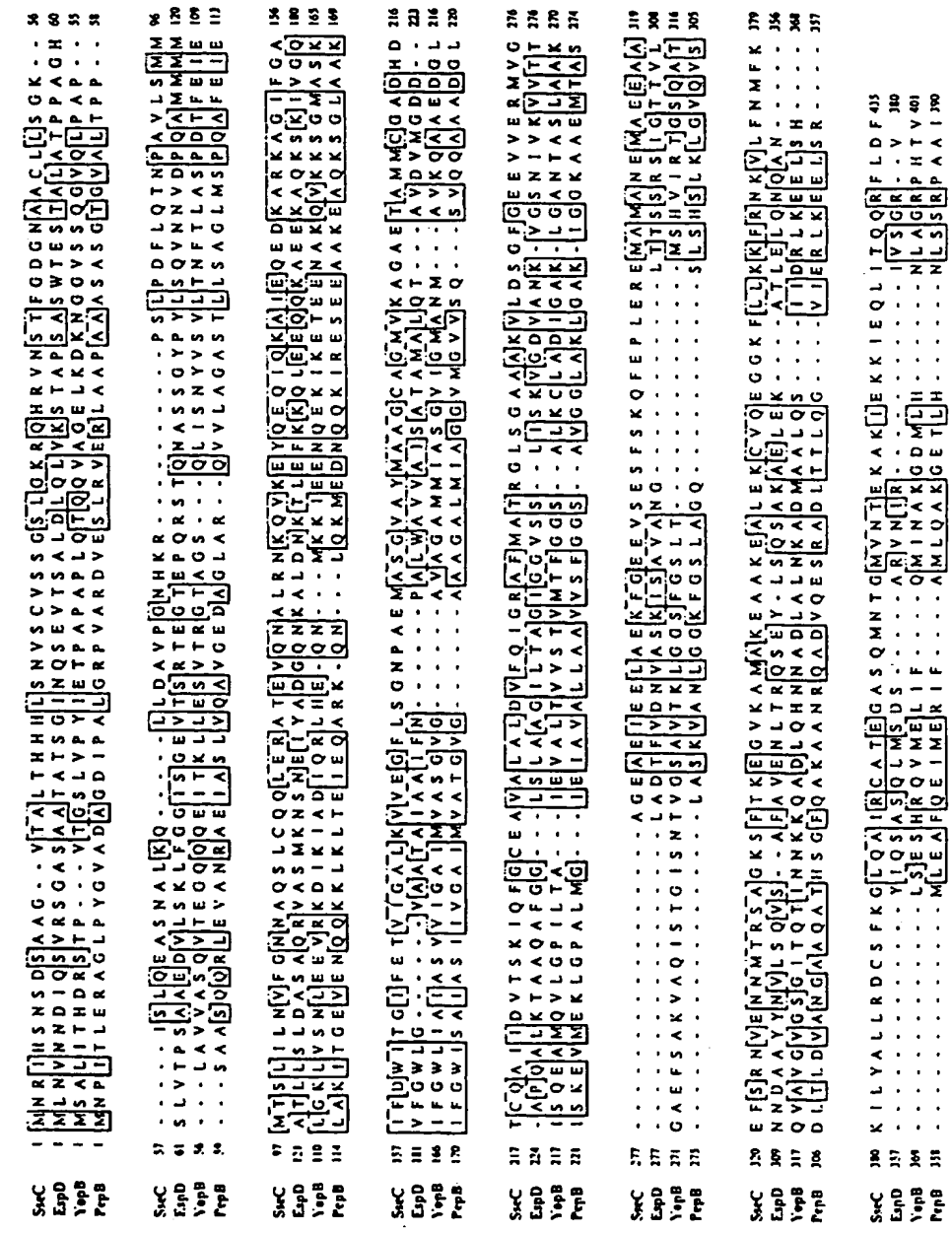


FIG. 3

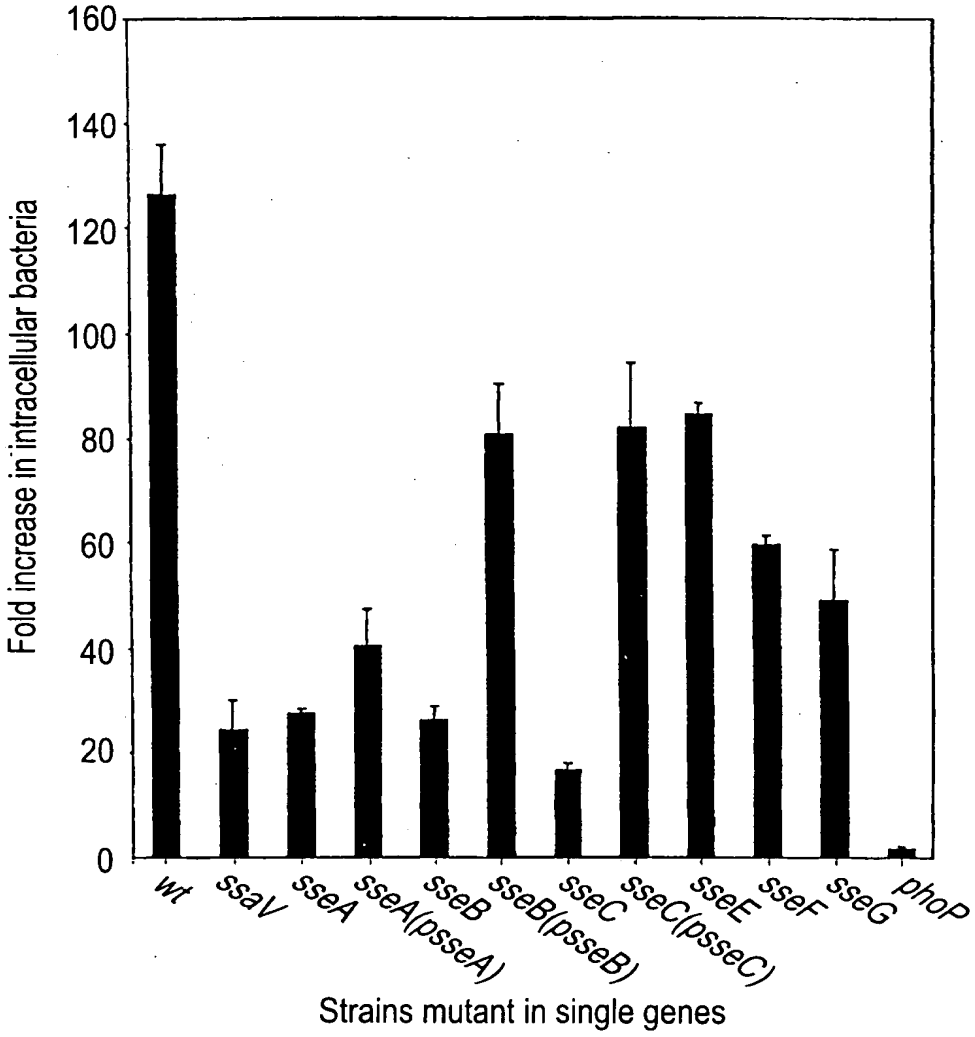

160
140
120
100
80
60
40
20
0
Fold increase in intracellular bacteria
wt
ssaV
sseA
sseA(psseA)
sseB
sseB(psseB)
sseC
sseC(psseC)
sseE
sseF
sseG
phoP
Strains mutant in single genes

FIG. 4A

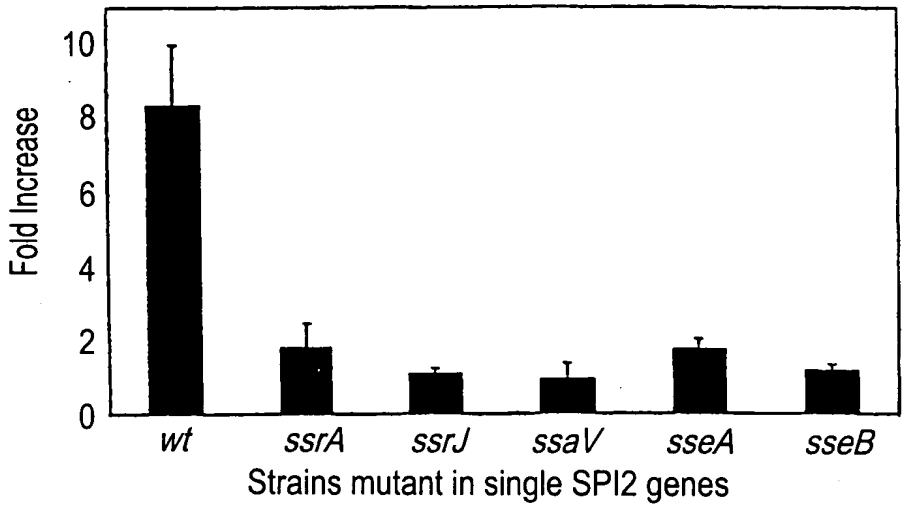

Fold Increase
10
8
6
4
2
0
wt
ssrA
ssrJ
ssaV
sseA
sseB
Strains mutant in single SPI2 genes

FIG. 4B

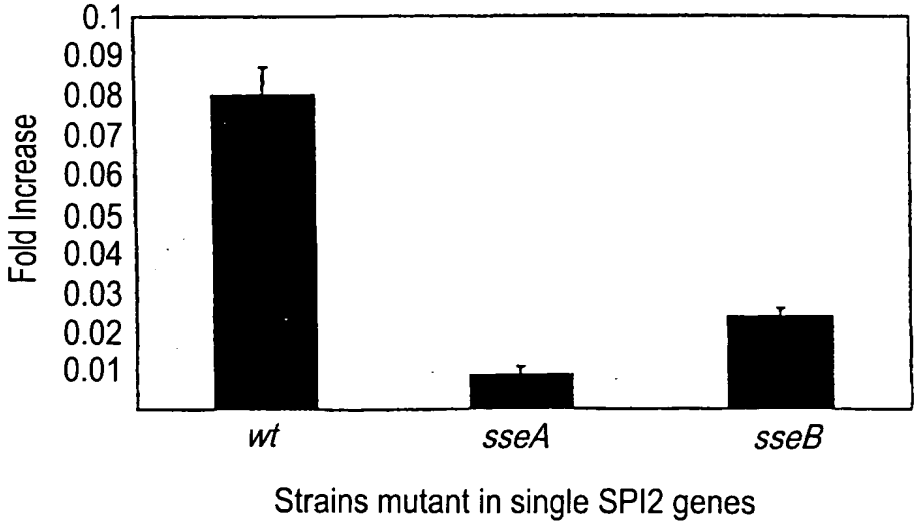

Fold Increase
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
wt
sseA
sseB
Strains mutant in single SPI2 genes

FIG. 5

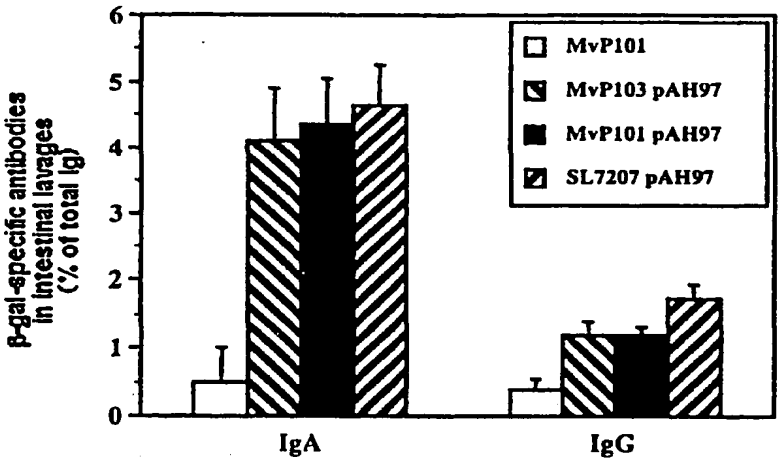

β-gal-specific antibodies in intestinal lavages (% of total Ig)
0
1
2
3
4
5
6
MvP101
MvP103 pAH97
MvP101 pAH97
SL7207 pAH97
IgA
IgG

FIG. 6

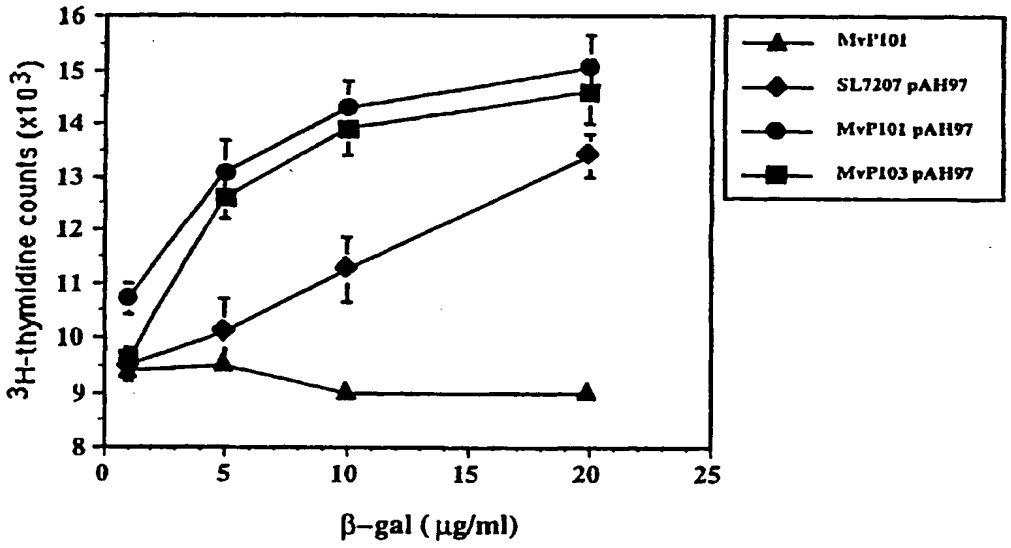

16
15
14
13
12
11
10
9
8
^{3}H-thymidine counts (x10^3)
0
5
10
15
20
25
β–gal (μg/ml)
MvP101
SL7207 pAH97
MvP101 pAH97
MvP103 pAH97

FIG. 7

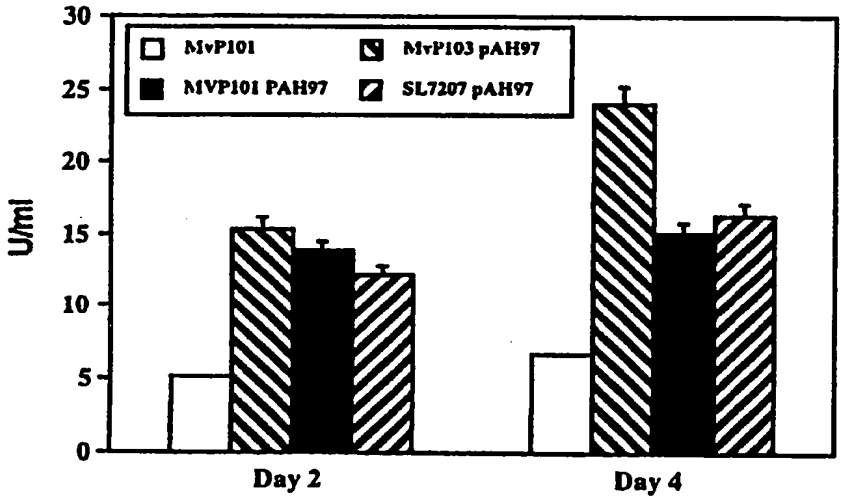

30
25
20
15
10
5
0
U/ml
MvP101
MvP103 pAH97
MVP101 PAH97
SL7207 pAH97
Day 2
Day 4

FIG. 8

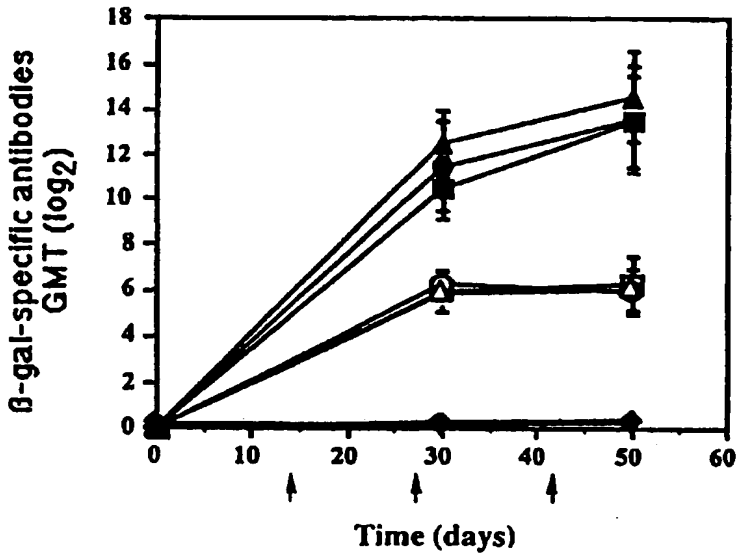

β-gal-specific antibodies
GMT (log2)
18
16
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
Time (days)

FIG. 9

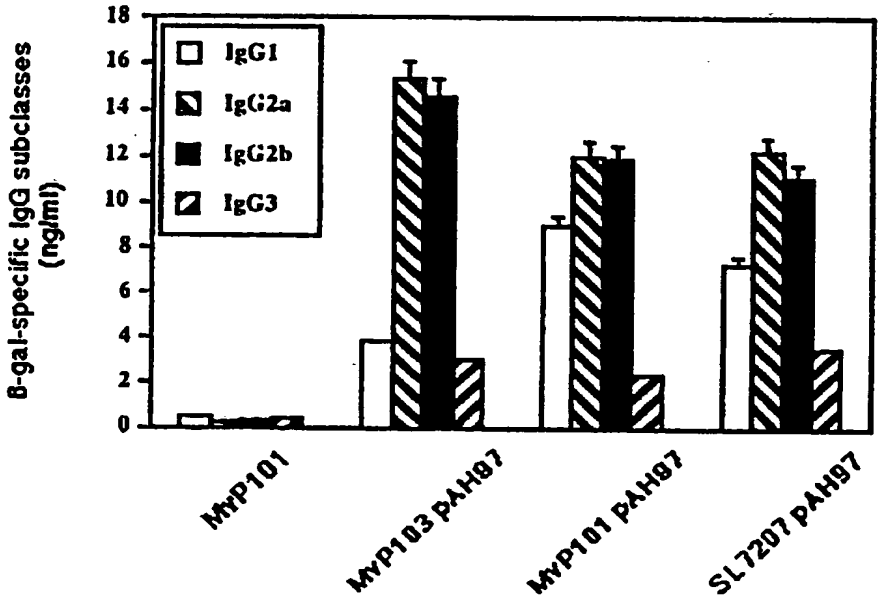

8-gal-specific IgG subclasses (ng/ml)
18
16
14
12
10
8
6
4
2
0
IgG1
IgG2a
IgG2b
IgG3
MvP101
MvP103 pAH97
MvP101 pAH97
SL7207 pAH97

FIG. 10

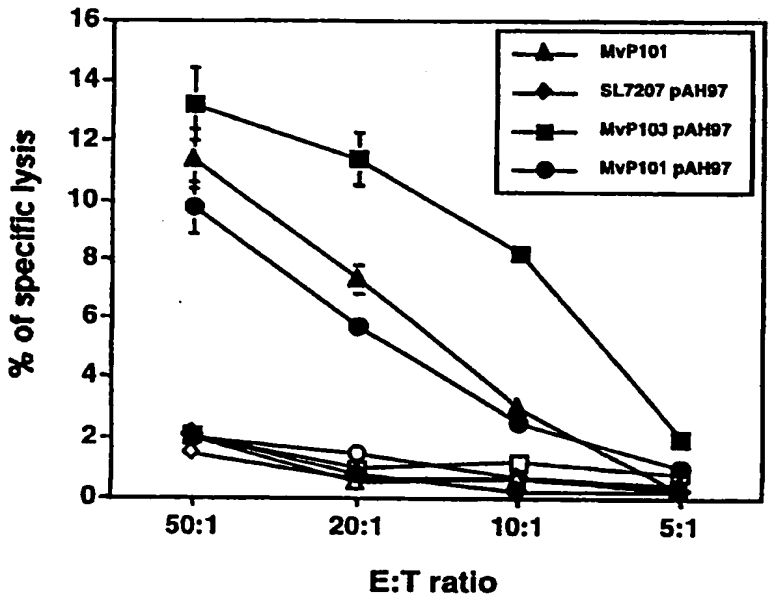
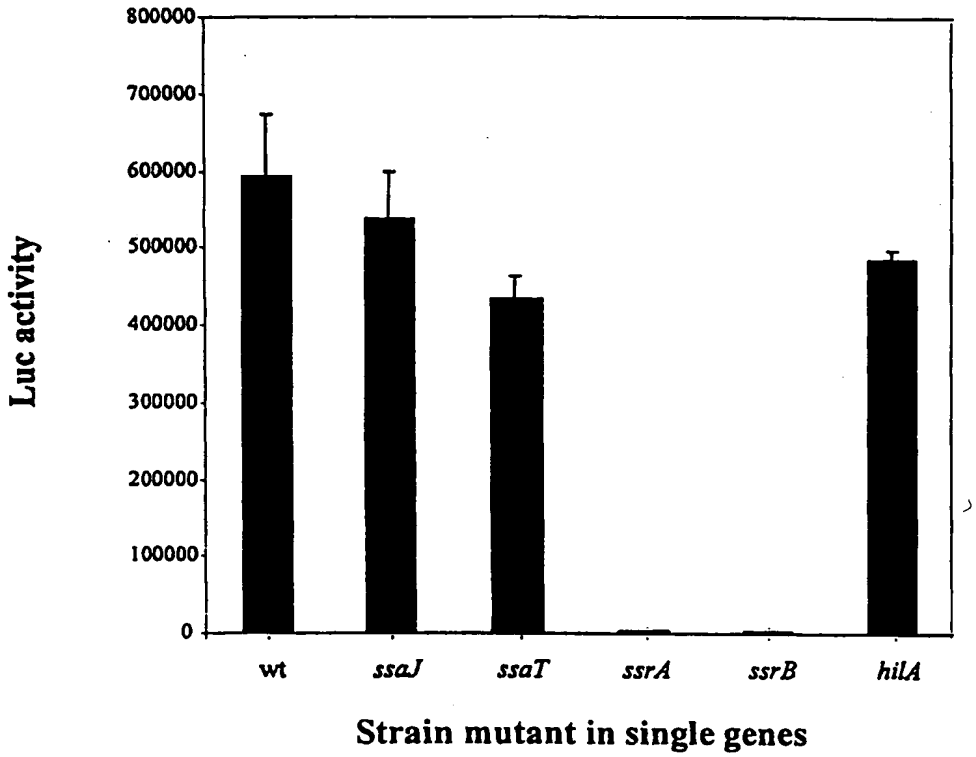

16
14
12
10
8
6
4
2
0
% of specific lysis
50:1
20:1
10:1
5:1
E:T ratio
MvP101
SL7207 pAH97
MvP103 pAH97
MvP101 pAH97

FIG. 11


800000
700000
600000
500000
400000
300000
200000
100000
0
Luc activity
wt
ssaJ
ssaT
ssrA
ssrB
hilA
Strain mutant in single genes

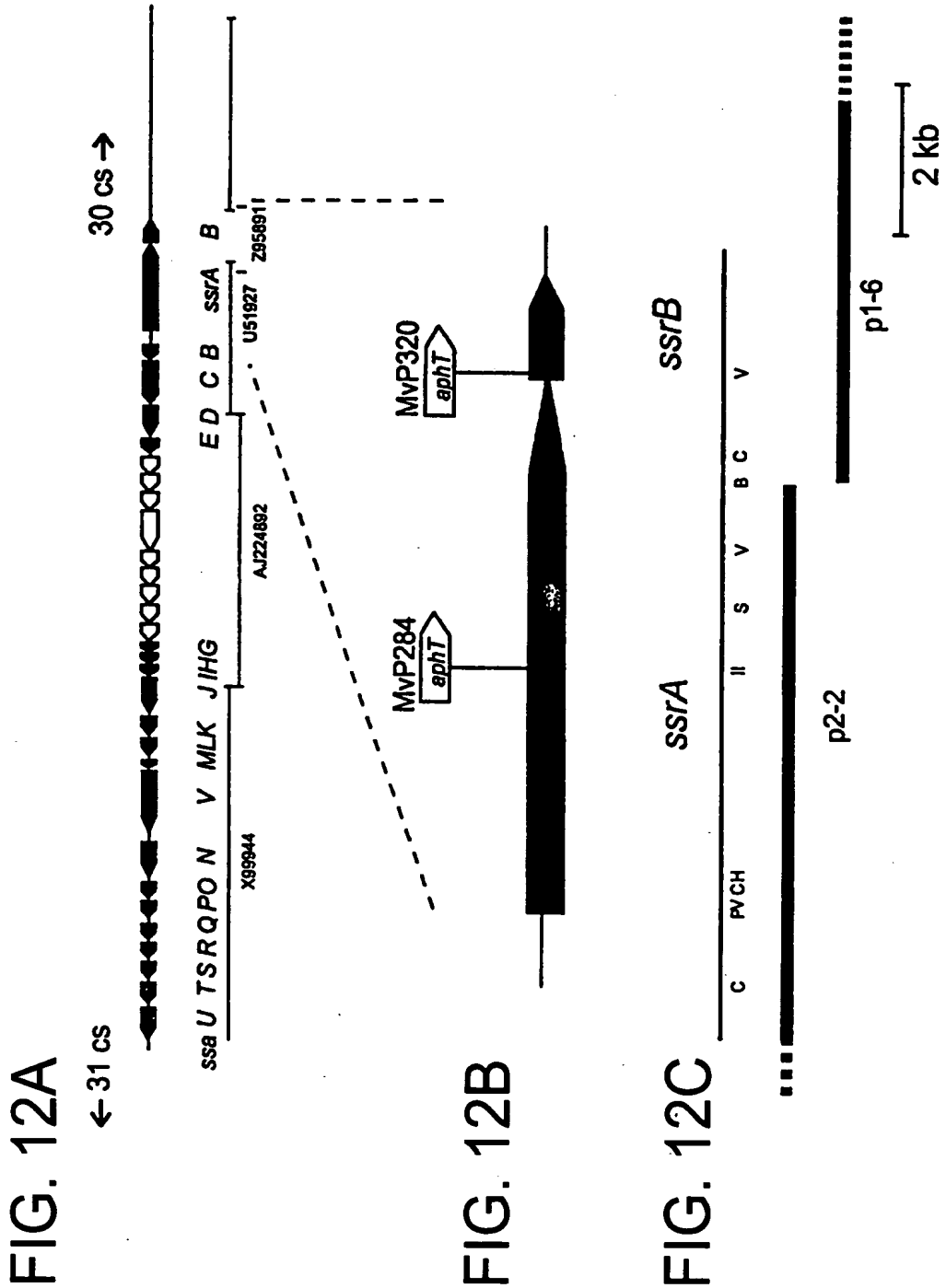


FIG. 12A

FIG. 12B

FIG. 12C

FIG. 13

Model for the transcriptional units for SPI2 virulence genes

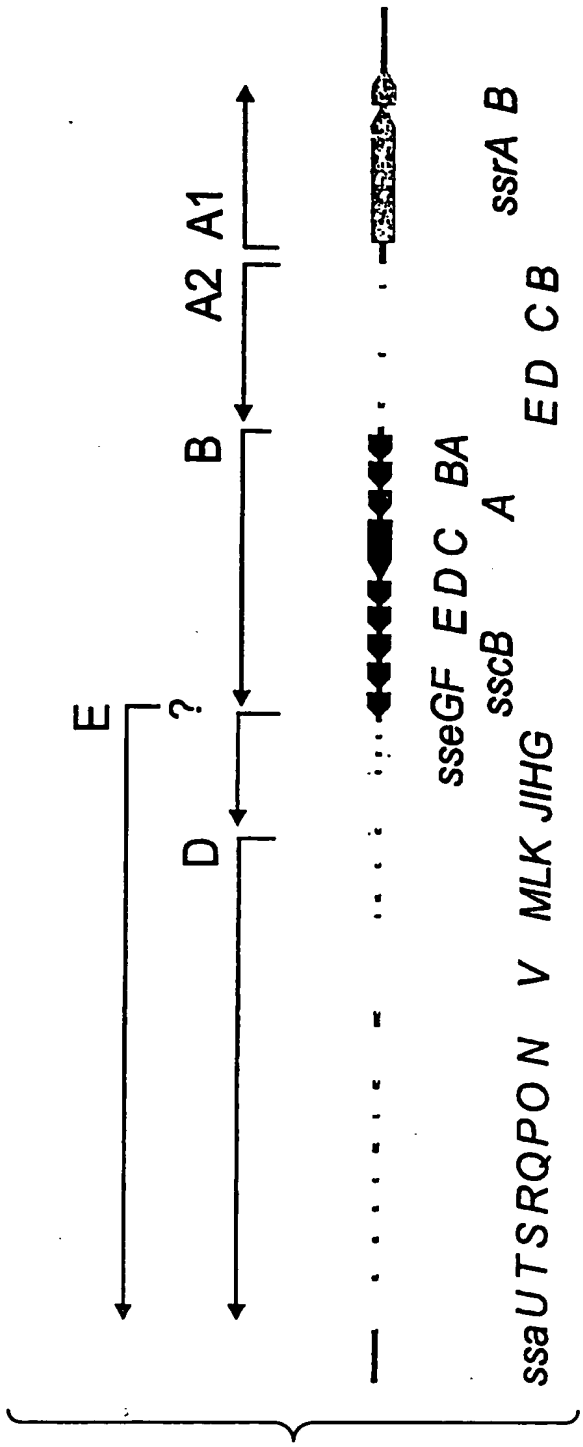


FIG. 14

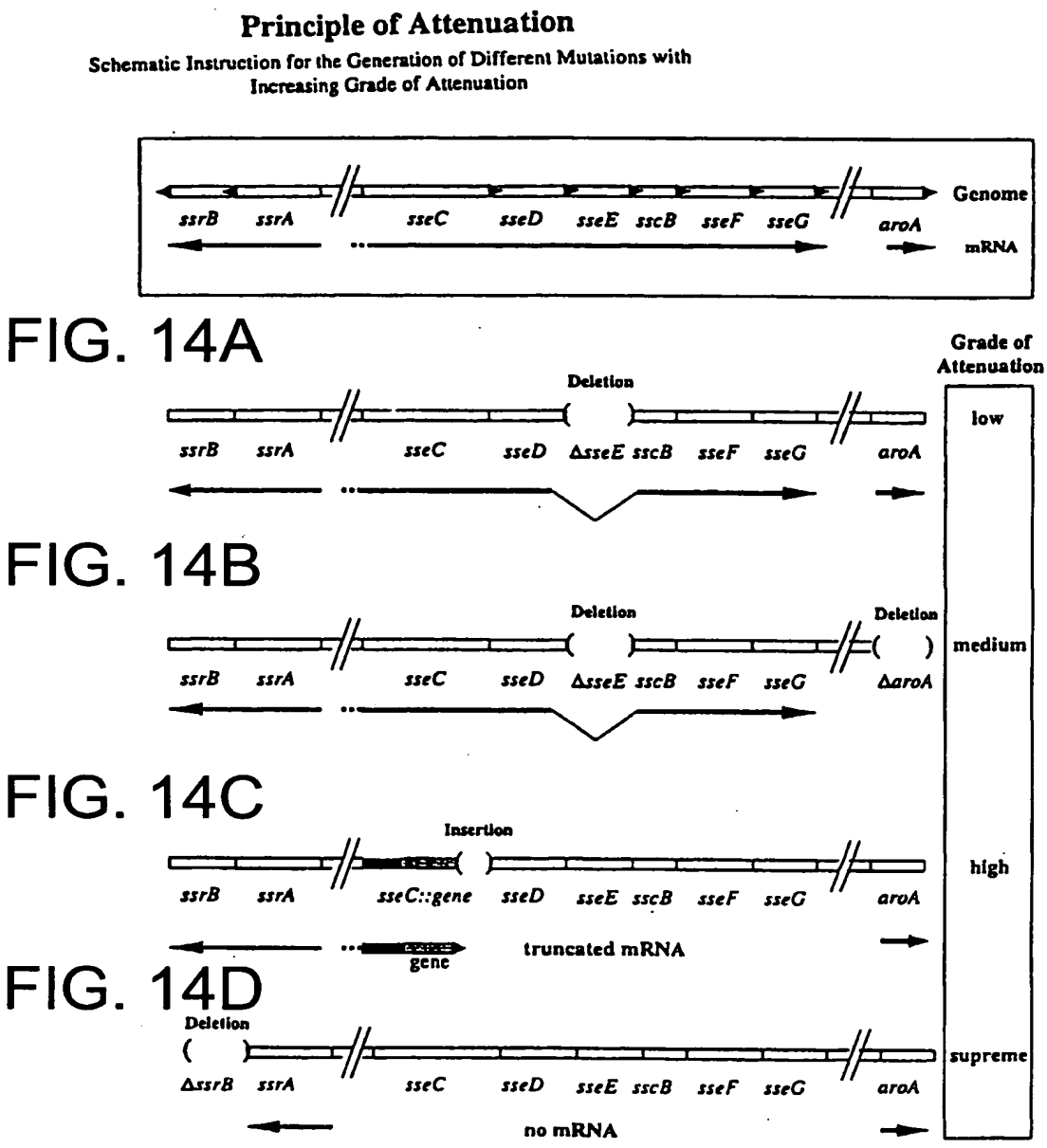


FIG. 14A

FIG. 14B

FIG. 14C

FIG. 14D

FIG. 15

Principle of insertional mutation

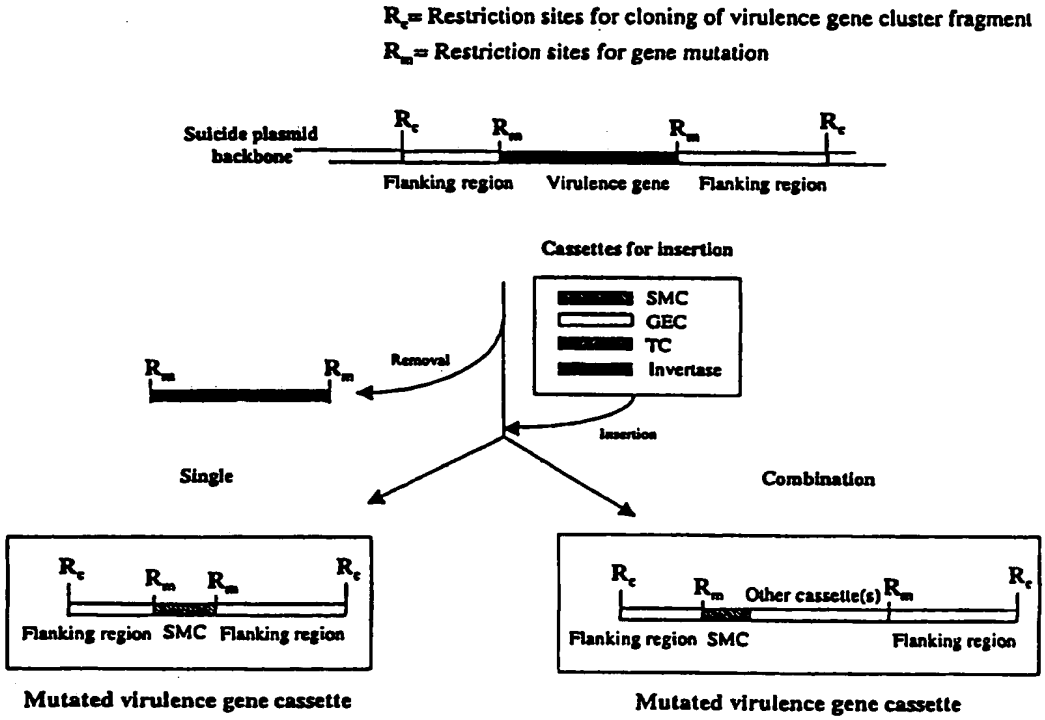
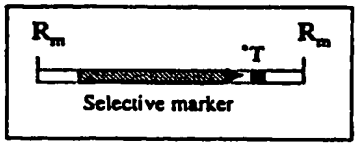


FIG. 16

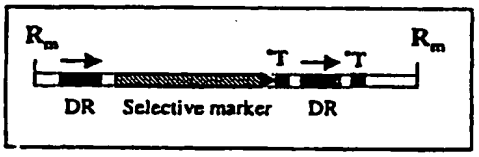
Selective Marker Cassette (SMC)

Permanent selective marker cassette



°T = Optional transcriptional terminator if polar insertional mutation is required

Revertible selective marker cassette



DR= direct repeat

FIG. 17

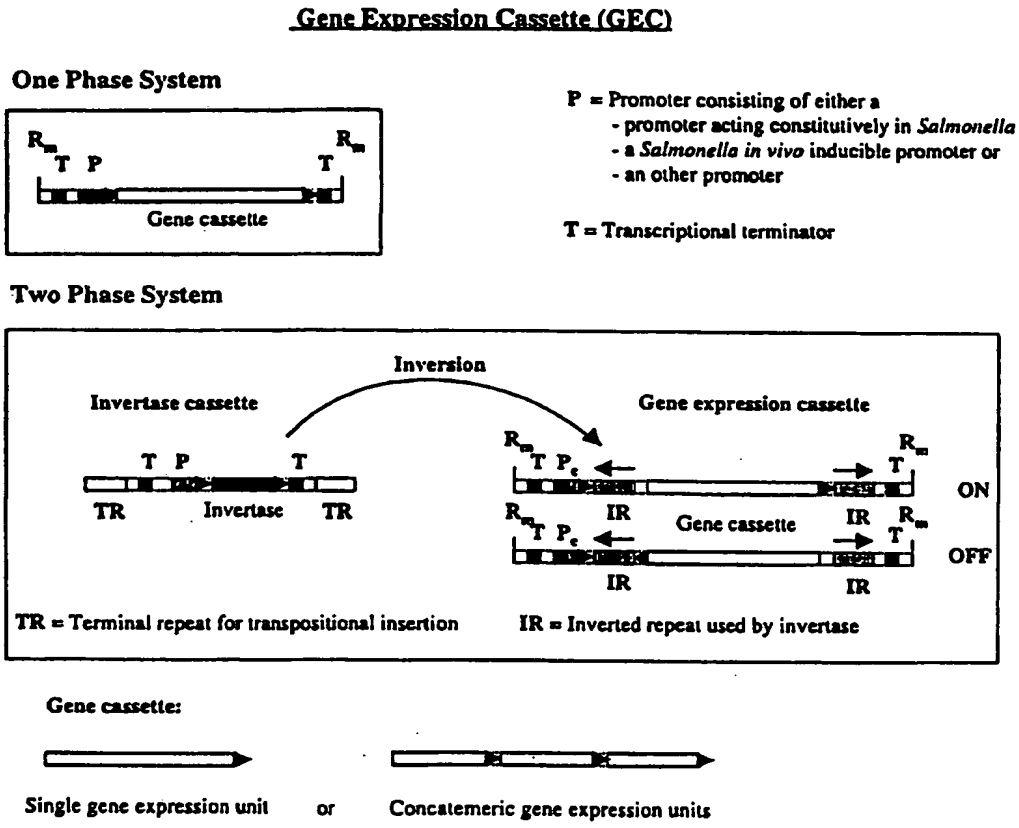

Gene Expression Cassette (GEC)
One Phase System
R
T P
T
R
Gene cassette
P = Promoter consisting of either a
- promoter acting constitutively in Salmonella
- a Salmonella in vivo inducible promoter or
- an other promoter
T = Transcriptional terminator
Two Phase System
Inversion
Invertase cassette
Gene expression cassette
T P
T
TR
Invertase
TR
R
T P
T
IR
Gene cassette
IR
R
ON
OFF
IR
IR
TR = Terminal repeat for transpositional insertion
IR = Inverted repeat used by invertase
Gene cassette:
Single gene expression unit
or
Concatemeric gene expression units

FIG. 18

Structural requirements of the gene expression unit for the delivery of heterologous antigens into the various *Salmonella* compartments

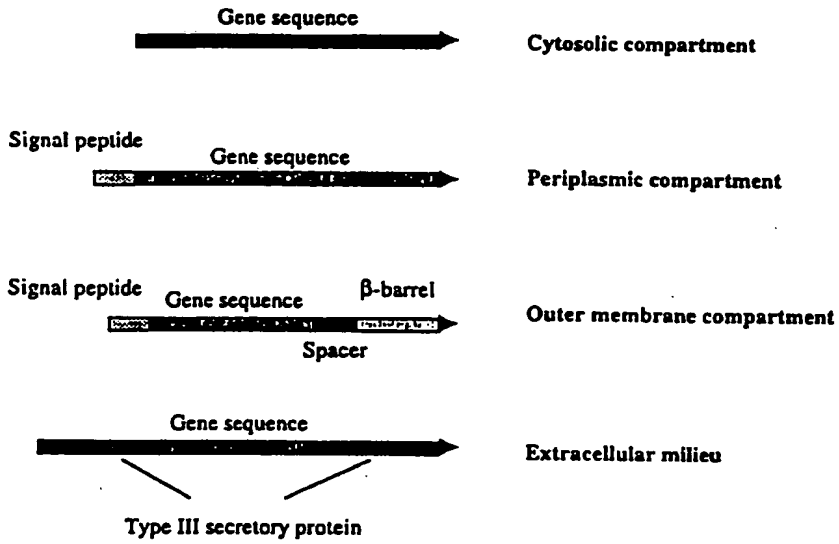


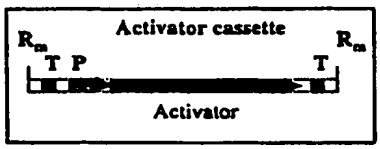
FIG. 19

Transactivator Cassette (TC)

P = Promoter consisting of either a
- promoter acting constitutively in *Salmonella*
- a *Salmonella in vivo* inducible promoter or
- an other promoter

P_c = Constitutive promoter

One Phase System



Two Phase System

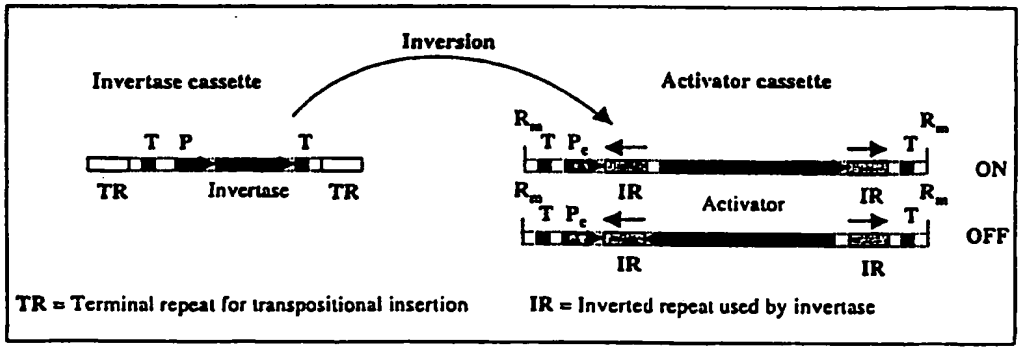


FIG. 20

P = Promoter consisting of either a
- promoter acting constitutively in *Salmonella*
- a *Salmonella in vivo* inducible promoter or
- an other promoter

P_c = Costituitive promoter
P_{ivi} = In vivo inducible promoter
P_{act} = Acitvatable promoter

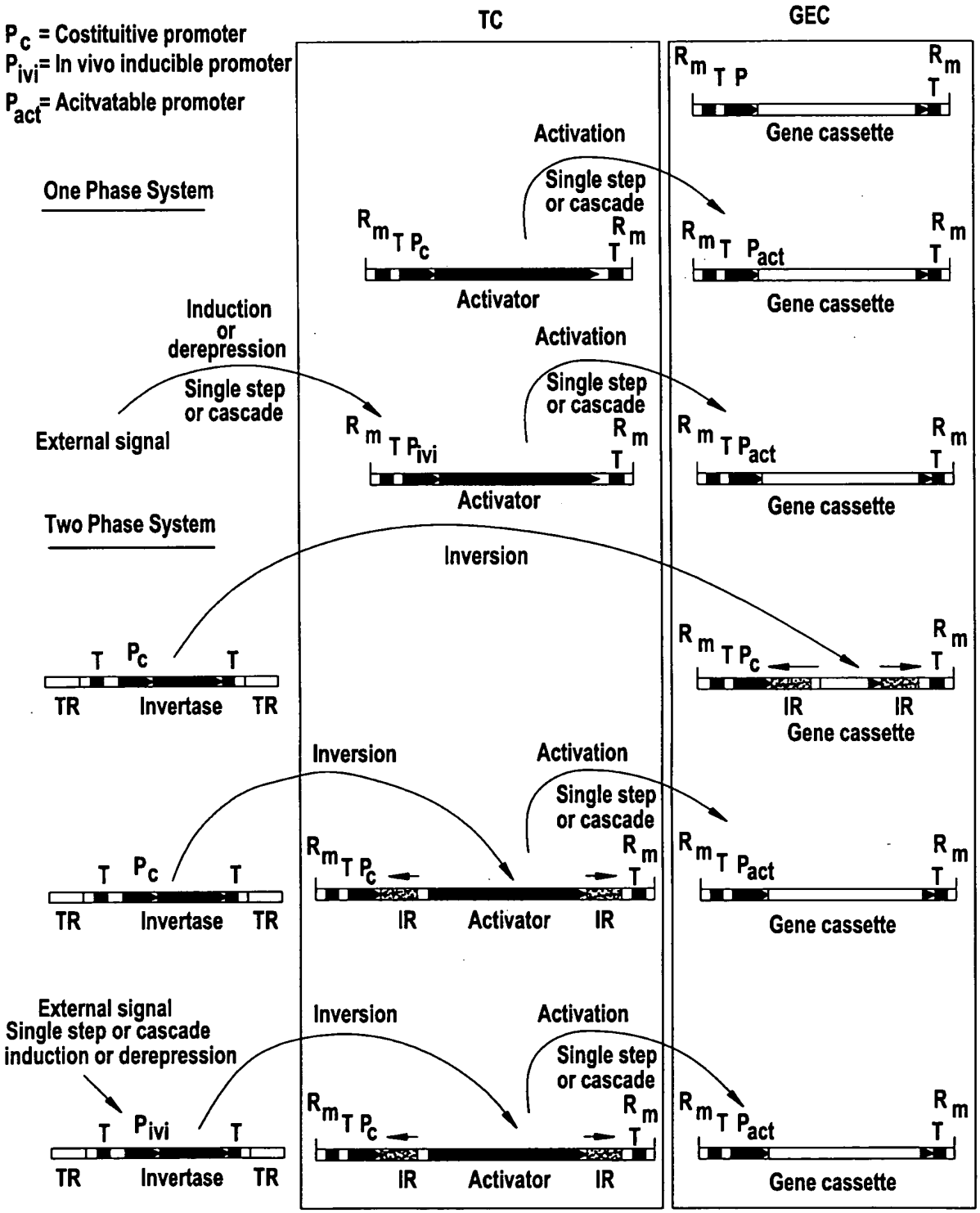


FIG. 21A

CTGCAGTTGTCCGGTTATTGCTCGTCAAGCGAACAGATGCAAAAGGTGAGAGCGACTCTCGAATCATGGGGGGTCATGTA
TCGGGATGGTGTAATCTGTGATGACTTATTGGTACGAGAAGTGCAGGATGTTTTGATAAAAATGGGTTACCCGCATGCTG
AAGTATCCAGCGAAGGGCCGGGGAGCGTGTTAATTCATGATGATATACAAATGGATCAGCAATGGCGCAAGGTTCAACCA
TTACTTGCAGATATTCCCGGGTTATTGCACTGGCAGATTAGTCACTCTCATCAGTCTCAGGGGGATGATATTATTTCTGC
GATAATAGAGAACGGTTTAGTGGGGCTTGTCAATGTTAGCCCAATGCGGCGCTCTTTTGTTATCAGTGGTGTACTGGATG
AATCTCATCAACGCATTTTGCAAGAAACGTTAGCAGCATTAAAGAAAAAGGATCCCGCTCTTTCTTTAATTTATCAGGAT
ATTGCGCCTTCCCATGATGAAAGCAAGTATCTGCCTGCGCCAGTGGCTGGCTTTGTACAGAGTCGCCATGGTAATTACTT
ATTACTGACGAATAAAGAGCGTTTACGTGTAGGGGCATTGTTACCCAATGGGGGAGAAATTGTCCATCTGAGTGCCGATG
TGGTAACGATTAAACATTATGATACTTTGATTAACTATCCATTAGATTTTAAGTGAGTGGAAAATGACAACTTTGACCCG
GTTAGAAGATTTGCTGCTTCATTCGCGTGAAGAGGCCAAAGGCATAATTTTACAATTAAGGGCTGCCCGGAAACAGTTAG
AAGAGAACAACGGCAAGTTACAGGATCCGCAGCAATATCAGCAAAACACCTTATTGCTTGAAGCGATCGAGCAGGCCGAA
AATATCATCAACATTATTTATTATCGTTACCATAACAGCGCACTTGTAGTGAGTGAGCAAGAGTAAAGTAAAAATATCTT
AGAGCCTATCCCACCAGGCGTTAATTGGCGCAGCCAGTTTGGACACGGATAGCGCGCAAAAACCGCAGCGTACACGTAGT
ACGTGAGGTTTGACTCGCTACGCTCGCCCTTCGGGCCGCCGCTAGCGGCGTTCAAAACGCTAACGCGTTTTGGCGAGCAC
TGCCCAGGTTCAAAATGGCAAGTAAAATAGCCTAATGGGATAGGCTCTTAGTTAGCACGTTAATTATCTATCGTGTATAT
GGAGGGGAATGATGATAAAGAAAAAGGCTGCGTTTAGTGAATATCGTGATTTAGAGCAAAGTTACATGCAGCTAAATCAC
TGTCTTAAAAAATTTCACCAAATCCGGGCTAAGGTGAGTCAACAGCTTGCTGAAAGGGCAGAGAGCCCCAAAAATAGCAG
AGAGACAGAGAGTATTCTTCATAACCTATTTCCACAAGGCGTTGCCGGGGTTAACCAGGAGGCCGAGAAGGATTTAAAGA
AAATAGTAAGTTTGTTTAAACAACTTGAAGTACGACTGAAACAACTTAATGCTCAAGCCCCGGTGGAGATACCGTCAGGA
AAAACAAAAAGGTAAAGCATAATGTCTTCAGGAAACATCTTATGGGGAAGTCAAAACCCTATTGTGTTTAAAAATAGCTT
CGGCGTCAGCAACGCTGATACCGGGAGCCAGGATGACTTATCCCAGCAAAATCCGTTTGCCGAAGGGTATGGTGTTTTGC
TTATTCTCCTTATGGTTATTCAGGCTATCGCAAATAATAAATTTATTGAAGTCCAGAAGAACGCTGAACGTGCCAGAAAT
ACCCAGGAAAAGTCAAATGAGATGGATGAGGTGATTGCTAAAGCAGCCAAAGGGGATGCTAAAACCAAAGAGGAGGTGCC
TGAGGATGTAATTAAATACATGCGTGATAATGGTATTCTCATCGATGGTATGACCATTGATGATTATATGGCTAAATATG
GCGATCATGGGAAGCTGGATAAAGGTGGCCTACAGGCGATCAAAGCGGCTTTGGATAATGACGCCAACCGGAATACCGAT
CTTATGAGTCAGGGGCAGATAACAATTCAAAAAATGTCTCAGGAGCTTAACGCTGTCCTTACCCAACTGACAGGGCTTAT
CAGTAAGTGGGGGGAAATTTCCAGTATGATAGCGCAGAAAACGTACTCATGAAAAAAGACCCGACCCTACAACAGGCACA
TGACACGATGCGGTTTTTCCGGCGTGGCGGCTCGCTGCGTATGTTGTTGGATGACGATGTTACACAGCCGCTTAATACTC
TGTATCGCTATGCCACGCAGCTTATGGAGGTAAAAGAATTCGCCGGCGCAGCGCGACTTTTTCAATTGCTGACGATATAT
GATGCCTGGTCATTTGACTACTGGTTTCGGTTAGGGGAATGCTGCCAGGCTCAAAAACATTGGGGGGAAGCGATATACGC
TTATGGACGCGCGGCACAAATTAAGATTGATGCGCCGCAGGCGCCATGGGCCGCAGCGGAATGCTATCTCGCGTGTGATA
ACGTCTGTTATGCAATCAAAGCGTTAAAGGCCGTGGTGCGTATTTGCGGCGAGGTCAGTGAACATCAAATTCTCCGACAG
CGTGCAGAAAAGATGTTACAGCAACTTTCTGACAGGAGCTAAAAATGAATCGAATTCACAGTAATAGCGACAGCGCCGCA
GGAGTAACCGCCTTAACACATCATCACTTAAGCAATGTCAGTTGCGTTTCCTCGGGTTCGCTGGGAAAGCGCCAGCATCG
TGTGAATTCTACTTTTGGCGATGGCAACGCCGCGTGTCTGCTATCCGGGAAAATTAGTCTTCAGGAGGCAAGCAATGCGT
TGAAGCAACTGCTTGATGCCGTACCCGGAAATCATAAGCGTCCATCATTGCCTGACTTTTTGCAGACCAATCCCGCGGTT
TTATCAATGATGATGACGTCATTAATACTCAACGTCTTTGGTAATAACGCTCAATCGTTATGCCAACAGCTTGAGCGGGC
AACTGAGGTGCAAAATGCATTACGTAATAAGCAGGTAAAGGAGTATCAGGAGCAGATCCAGAAAGCGATAGAGCAGGAGG
ATAAAGCGCGTAAAGCGGGTATTTTTGGCGCTATTTTTGACTGGATTACCGGCATATTTGAAACCGTGATTGGCGCCTTA
AAAGTTGTGGAAGGTTTTCTGTCCGGAAATCCCGCAGAAATGGCTAGCGGCGTAGCTTATATGGCCGCAGGTTGTGCAGG
AATGGTTAAAGCCGGAGCCGAAACGGCAATGATGTGCGGTGCTGACCACGATACCTGTCAGGCAATTATTGACGTGACAA
GTAAGATTCAATTTGGTTGTGAAGCCGTCGCGCTGGCACTGGATGTTTTCCAGATTGGCCGTGCTTTTATGGCGACGAGA
GGTTTATCTGGCGCAGCTGCAAAAGTGCTTGACTCCGGTTTTGGCGAGGAAGTGGTTGAGCGTATGGTAGGTGCAGGGGA
AGCAGAAATAGAGGAGTTGGCTGAAAAGTTTGGCGAAGAAGTGAGCGAAAGTTTTTCCAAACAATTTGAGCCGCTTGAAC
GTGAAATGGCTATGGCGAATGAGATGGCAGAGGAGGCTGCCGAGTTTTCTCGTAACGTAGAAAATAATATGACGCGAAGC
GCGGGAAAAAGCTTTACGAAAGAGGGGGTGAAAGCCATGGCAAAAGAAGCGGCAAAAGAAGCCCTGGAAAAATGTGTGCA
AGAAGGTGGAAAGTTCCTGTTAAAAAAATTCCGTAATAAAGTTCTCTTCAATATGTTCAAAAAAATCCTGTATGCCTTAC
TGAGGGATTGTTCATTTAAAGGCTTACAGGCTATCAGATGTGCAACCGAGGGCGCCAGTCAGATGAATACTGGCATGGTT
AACACAGAAAAAGCGAAGATCGAAAAGAAAATAGAGCAATTAATAACTCAGCAACGGTTTCTGGATTTCATAATGCAACA
AACAGAAAACCAGAAAAAGATAGAACAAAAACGCTTAGAGGAGCTTTATAAGGGGACGGGTGCCGCGCTTAGAGATGTAT
TAGATACCATTGATCACTATAGTAGCGTTCAGGCGAGAATAGCTGGCTATCGCGCTTAATCTGAGGATAAAAATATGGAA
GCGAGTAACGTAGCACTGGTATTACCAGCGCCTTCCTTGTTAACACCTTCTTCCACTCCATCTCCCTCCGGGGAGGGAAT
GGGTACTGAATCAATGCTTCTGTTATTTGATGATATCTGGATGAAGCTAATGGAGCTTGCCAAAAAGCTGCGCGATATCA
TGCGCAGCTATAACGTAGAAAAACAACGGCTGGCCTGGGAACTGCAAGTCAATGTTTTACAGACGCAAATGAAAACAATT
GATGAAGCGTTTAGAGCATCAATGATTACTGCGGGTGGCGCAATGTTGTCGGGTGTACTGACGATAGGATTAGGGGCCGT

FIG. 21A-1

AGGCGGGGAAACCGGTCTTATAGCGGGTCAAGCCGTAGGCCACACAGCTGGGGGCGTCATGGGCCTGGGGGCTGGTGTAG
CGCAACGTCAAAGTGATCAAGATAAAGCGATTGCCGACCTGCAACAAAATGGGGCCCAATCTTATAATAAATCCCTGACG
GAAATTATGGAGAAAGCAACTGAAATTATGCAGCAAATCATCGGCGTGGGGTCGTCACTGGTCACGGTTCTTGCTGAAAT
ACTCCGGGCATTAACGAGGTAAACATGGTGCAAGAAATAGAGCAATGGTTACGTCGGCATCAGGTGTTTACTGAGCCTGC
ATATTTAGGGGAGACCGCCATATTACTTGGGCAGCAGTTTATATTATCGCCTTACCTGGTGATCTATCGTATTGAGGCAA
AAGAAATGATTATTTGTGAGTTCAGGCGCCTGACGCCCGGGCAACCTCGACCACAGCAATTGTTTCACTTACTGGGACTT
TTACGCGGGATATTTGTGCATCACCCGCAGTTAACATGTTTAAAGATGTTGATAATCACCGACGTTCTGGATGAAAAAAA
AGCCATGCTACGCAGGAAATTATTGCGCATCCTGACAGTAATGGGAGCGACCTTTACACAGCTTGATGGCGATAACTGGA
CAGTTTTATCCGCCGAGCATCTTATCCAGCGACGTTTTTAAATGACCTTCCTGACGTAAATCATTATCACGTGAAAATAA
CAATCAATAGGTATGATGATGAAAGAAGATCAGAAAAATAAAATACCCGAAGACATTCTGAAACAGCTATTATCCGTTGA
TCCGGAAACCGTTTATGCCAGTGGTTACGCCTCATGGCAGGAGGGGGATTATTCGCGCGCCGTAATCGATTTTAGTTGGC
TGGTGATGGCCCAGCCATGGAGTTGGCGTGCCCATATTGCATTGGCTGGCACCTGGATGATGCTTAAAGAATACACGACG
GCCATTAATTTCTATGGACATGCCTTGATGCTGGATGCCAGCCATCCAGAACCGGTTTACCAAACGGGCGTCTGTCTCAA
AATGATGGGGGAACCCGGGTTGGCGAGAGAGGCTTTTCAAACCGCAATCAAGATGAGTTATGCGGATGCCTCATGGAGTG
AGATTCGCCAGAATGCGCAAATAATGGTTGATACTCTTATTGCTTAAATAACAGAACGAAATATGAAAATTCATATTCCG
TCAGCGGCAAGTAATATAGTCGATGGTAATAGTCCTCCTTCCGATATACAAGCGAAGGAGGTATCGTTTCCTCCCCCTGA
AATTCCAGCGCCTGGCACCCCCGCAGCCCCTGTGCTGCTTACGCCTGAACAAATAAGGCAGCAGAGGGATTATGCGATAC
ATTTTATGCAATACACTATTCGTGCGCTGGGTGCGACAGTCGTGTTTGGGTTATCGGTTGCTGCAGCGGTAATTTCTGGC
GGGGCAGGATTACCCATTGCTATTCTTGCGGGGGCGGCGCTCGTGATTGCTATTGGGGATGCTTGCTGTGCGTATCATAA
TTATCAATCGATATGTCAGCAAAAGGAGCCATTACAAACCGCCAGTGATAGCGTTGCTCTTGTGGTCAGTGCGCTGGCCT
TAAAATGTGGGGCAAGTCTTAACTGCGCTAACACCCTTGCTAATTGTCTTTCTTTATTAATACGTTCAGGAATCGCTATT
TCTATGTTGGTTTTACCCCTACAGTTTCCACTGCCCGCGGCTGAAAATATTGCGGCCTCTTTGGACATGGGGAGTGTAAT
TACCTCCGTTAGCCTGACGGCGATAGGTGCGGTACTGGATTATTGCCTTGCCCGCCCCTCTGGCGACGATCAGGAAAATT
CTGTTGATGAACTTCATGCCGATCCCAGTGTGTTATTGGCGGAACAAATGGCAGCGCTCTGTCAATCTGCTACTACACCT
GCACCTGCATTAATGGACAGTTCTGATCATACATCTCGGGGAGAACCATGAAACCTGTTAGCCCAAATGCTCAGGTAGGA
GGGCAACGTCCTGTTAACGCGCCTGAGGAATCACCTCCATGTCCTTCATTGCCACATCCGGAAACCAATATGGAGAGTGG
TAGAATAGGACCTCAACAAGGAAAAGAGCGGGTATTGGCCGGACTTGCGAAACGAGTGATAGAGTGTTTTCCAAAAGAAA
TTTTTAGTTGGCAAACGGTTATTTTGGGCGGACAGATTTTATGCTGTTCCGCTGGAATAGCATTAACAGTGCTAAGTGGT
GGAGGCGCGCCGCTCGTAGCCCTGGCAGGGATTGGCCTTGCTATTGCCATCGCGGATGTCGCCTGTCTTATCTACCATCA
TAAACATCATTTGCCTATGGCTCACGACAGTATAGGCAATGCCGTTTTTTATATTGCTAATTGTTTCGCCAATCAACGCA
AAAGTATGGCGATTGCTAAAGCCGTCTCCCTGGGCGGTAGATTAGCCTTAACCGCGACGGTAATGACTCATTCATACTGG
AGTGGTAGTTTGGGACTACAGCCTCATTTATTAGAGCGTCTTAATGATATTACCTATGGACTAATGAGTTTTACTCGCTT
CGGTATGGATGGGATGGCAATGACCGGTATGCAGGTCAGCAGCCCATTATATCGTTTGCTGGCTCAGGTAACGCCAGAAC
AACGTGCGCCGGAGTAATCGTTTTCAGGTATATACCGGATGTTCATTGCTTTCTAAATTTTGCTATGTTGCCAGTATCCT
TACGATGTATTTATTTTAAGGAAAAGCATTATGGATATTGCACAATTAGTGGATATGCTCTCCCACATGGCGCACCAGGC
AGGCCAGGCCATTAATGACAAAATGAATGGTAATGATTTGCTCAACCCAGAATCGATGATTAAAGCGCAATTTGCCTTAC
AGCAGTATTCTACATTTATTAATTACGAAAGTTCACTGATCAAAATGATCAAGGATATGCTTAGTGGAATCATTGCTAAA
ATCTGAAGTTATTAGCGACGATGTTCGACGGTTGCTGCTGGAAATCATGTTTGCGGGCGTTAACCATAGCCTGATTTCCC
AGGTACATGCGATGTTACCAGCGCTAACGGTTATTGTTCCGGATAAAAAATTACAGTTGGTATGTCTGGCATTATTGTTG
GCGGGTTTAAATGAGCCGCTAAAAGCCGCGAAAATTTTATCGGATATAGATTTGCCAGAGGCTATGGCGCTGCGTCTGTT
ATTTCCTGCACCAAATGAGGGGTTTGAAAATTGAATATTTCTGATATGAGCGTAGTGCCTGTAAGCACTCAATCTTATGT
AAAGTCCTCTGCAGAACCGAGCCAGGAGCAAATTAATTTTTTTGAACAATTGCTGAAAGATGAAGCATCCACCAGTAACG
CCAGTGCTTTATTACCGCAGGTTATGTTGACCAGACAAATGGATTATATGCAGTTAACGGTAGGCGTCGATTATCTTGCC
AGAATATCAGGCGCAGCATCGCAAGCGCTTAATAAGCTGGATAACATGGCATGAAGGTTCATCGTATAGTATTTCTTACT
GTCCTTACGTTCTTTCTTACGGCATGTGATGTGGATCTTTATCGCTCATTGCCAGAAGATGAAGCGAATCAAATGCTGGC
ATTACTTATGCAGCATCATATTGATGCGGAAAAAAAACAGGAAGAGGATGGTGTAACCTTACGTGTCGAGCAGTCGCAGT
TTATTAATGCGGTTGAGCTACTTAGACTTAACGGTTATCCGCATAGGCAGTTTACAACGGCGGATAAGATGTTTCCGGCT
AATCAGTTAGTGGTATCACCCCAGGAAGAACAGCAGAAGATTAATTTTTTAAAAGAACAAAGAATTGAAGGAATGCTGAG
TCAGATGGAGGGCGTGATTAATGCAAAAGTGACCATTGCGCTACCGACTTATGATGAGGGAAGTAACGCTTCTCCGAGCT
CAGTTGCCGTATTTATAAAATATTCACCTCAGGTCAATATGGAGGCCTTTCGGGTAAAAATTAAAGATTTAATAGAGATG
TCAATCCCTGGGTTGCAATACAGTAAGATTAGTATCTTGATGCAGCCTGCTGAATTC

FIG. 21B

AGCATTGACATAAAAACTTACAATTTGAAAAATTATTTATTAAATAAACTGTTACGATGTTTTTACATCGCCATCTTATT
AAAAAGTAATTGTAGTCATCGACTGGGTTATATATGAAGAAATTTATCTTCCTAATGATAACACCATCGATTAATCTTCT
GATGAAACTATATGTACTGCGATAGTGATCAAGTGCCAAAGATTTTGCAACAGGCAACTGGAGGGAAGCATTATGAATTT
GCTCAATCTCAAGAATACGCTGCAAACATCTTTAGTAATCAGGCTAACTTTTTTATTTTTATTAACAACAATAATTATTT
GGCTGCTATCTGTGCTTACCGCAGCTTATATATCAATGGTTCAGAAACGGCAGCATATAATAGAGGATTTATCCGTTCTA
TCCGAGATGAATATTGTACTAAGCAATCAACGGTTTGAAGAAGCTGAACGTGACGCTAAAAATTTAATGTATCAATGCTC
ATTAGCGACTGAGATTCATCATAACGATATTTTCCCTGAGGTGAGCCGGCATCTATCTGTCGGTCCTTCAAATTGCACGC
CGACGCTAAACGGAGAGAAGCACCGTCTCTTTCTGCAGTCCTCTGATATCGATGAAAATAGCTTTCGTCGCGATAGTTTT
ATTCTTAATCATAAAAATGAGATTTCGTTATTATCTACTGATAACCCTTCAGATTATTCAACTCTACAGCCTTTAACGCG
AAAAAGCTTTCCTTTATACCCAACCCATGCCGGGTTTTACTGGAGTGAACCAGAATACATAAACGGCAAAGGATGGCACG
CTTCCGTTGCGGTTGCCGATCAGCAAGGCGTATTTTTTGAGGTGACGGTTAAACTTCCCGATCTCATTACTAAGAGCCAC
CTGCCATTAGATGATAGTATTCGAGTATGGCTGGATCAAAACAACCACTTATTGCCGTTTTCATACATCCCGCAAAAAAT
ACGTACACAGTTAGAAAATGTAACGCTGCATGATGGATGGCAGCAAATTCCCGGATTTCTGATATTACGCACAACCTTGC
ATGGCCCCGGATGGAGTCTGGTTACGCTGTACCCATACGGTAATCTACATAATCGCATCTTAAAAATTATCCTTCAACAA
ATCCCCTTTACATTAACAGCATTGGTGTTGATGACGTCGGCTTTTTGCTGGTTACTACATCGCTCACTGGCCAAACCGTT
ATGGCGTTTTGTCGATGTCATTAATAAAACCGCAACTGCACCGCTGAGCACACGTTTACCAGCACAACGACTGGATGAAT
TAGATAGTATTGCCGGTGCTTTTAACCAACTGCTTGATACTCTACAAGTCCAATACGACAATCTGGAAAACAAAGTCGCA
GAGCGCACCCAGGCGCTAAATGAAGCAAAAAAACGCGCTGAGCGAGCTAACAAACGTAAAAGCATTCATCTTACGGTAAT
AAGTCATGAGTTACGTACTCCGATGAATGGCGTACTCGGTGCAATTGAATTATTACAAACCACCCCTTTAAACATAGAGC
AACAAGGATTAGCTGATACCGCCAGAAATTGTACACTGTCTTTGTTAGCTATTATTAATAATCTGCTGGATTTTTCACGC
ATCGAGTCTGGTCATTTCACATTACATATGGAAGAAACAGCGTTACTGCCGTTACTGGACCAGGCAATGCAAACCATCCA
GGGGCCAGCGCAAAGCAAAAAACTGTCATTACGTACTTTTGTCGGTCAACATGTCCCTCTCTATTTTCATACCGACAGTA
TCCGTTTACGGCAAATTTTGGTTAATTTACTCGGGAACGCGGTAAAATTTACCGAAACCGGAGGGATACGTCTGACGGTC
AAGCGTCATGAGGAACAATTAATATTTCTGGTTAGCGATAGCGGTAAAGGGATTGAAATACAGCAGCAGTCTCAAATCTT
TACTGCTTTTTATCAAGCAGACACAAATTCGCAAGGTACAGGAATTGGACTGACTATTGCGTCAAGCCTGGCTAAAATGA
TGGGCGGTAATCTGACACTAAAAAGTGTCCCCGGGGTTGGAACCTGTGTCTCGCTAGTATTACCCTTACAAGAATACCAG
CCGCCTCAACCAATTAAAGGGACGCTGTCAGCGCCGTTCTGCCTGCATCGGCAACTGGCTTGCTGGGGAATACGCGGTGA
ACCACCCCACCAGCAAAATGCGCTTCTCAACGCAGAGCTTTTGTATTTCTCCGGAAAACTCTACGACCTGGCGCAACAGT
TAATATTGTGTACACCAAATATGCCAGTAATAAATAATTTGTTACCACCCTGGCAGTTGCAGATTCTTTTGGTTGATGAT
GCCGATATTAATCGGGATATCATCGGCAAAATGCTTGTCAGCCTGGGCCAACACGTCACTATTGCCGCCAGTAGTAACGA
GGCTCTGACTTTATCACAACAGCAGCGATTCGATTTAGTACTGATTGACATTAGAATGCCAGAAATAGATGGTATTGAAT
GTGTACGATTATGGCATGATGAGCCGAATAATTTAGATCCTGACTGCATGTTTGTGGCACTATCCGCTAGCGTAGCGACA
GAAGATATTCATCGTTGTAAAAAAAATGGGATTCATCATTACATTACAAAACCAGTGACATTGGCTACCTTAGCTCGCTA
CATCAGTATTGCCGCAGAATACCAACTTTTACGAAATATAGAGCTACAGGAGCAGGATCCGAGTCGCTGCTCAGCGCTAC
TGGCGACAGATGATATGGTCATTAATAGCAAGATTTTCCAATCACTGGACCTCTTGCTGGCTGATATTGAAAATGCCGTA
TCGGCTGGAGAAAAAATCGATCAGTTAATTCACACATTAAAAGGCTGTTTAGGTCAAATAGGGCAGACTGAATTGGTATG
CTATGTCATAGACATTGAGAATCGCGTAAAAATGGGGAAAATCATCGCGCTGGAGGAACTAACCGACTTACGCCAGAAAA
TACGTATGATCTTCAAAAACTACACCATTACTTAATATTATCTTAATTTTCGCGAGGGCAGCAAAATGAAAGAATATAAG
ATCTTATTAGTAGACGATCATGAAATCATCATTAACGGCATTATGAATGCCTTATTACCCTGGCCTCATTTTAAAATTGT
AGAGCATGTTAAAAATGGTCTTGAGGTTTATAATGCCTGTTGTGCATACGAGCCTGACATACTTATCCTTGATCTTAGTC
TACCTGGCATCAATGGCCTGGATATCATTCCTCAATTACATCAGCGTTGGCCAGCAATGAATATTCTGGTTTACACAGCA
TACCAACAAGAGTATATGACCATTAAAACTTTAGCCGCAGGTGCTAATGGCTATGTTTTAAAAAGCAGTAGTCAGCAAGT
TCTGTTAGCGGCATTGCAAACAGTAGCAGTAAACAAGCGTTACATTGACCCAACGTTGAATCGGGAAGCTATCCTGGCTG
AATTAAACGCTGACACGACCAATCATCAACTGCTTACTTTGCGCGAGCGTCAGGTTCTTAAACTTATTGACGAGGGGTAT
ACCAATCATGGGATCAGCGAAAAGCTACATATCAGTATAAAAACCGTCGAAACACACCGGATGAATATGATGAGAAAGCT
ACAGGTTCATAAAGTGACAGAGTTACTTAACTGTGCCCGAAGAATGAGGTTAATAGAGTATTAACCAGGGGCGTCCGATG
GTATTAAGCATTGGTCATATTTTGATGAGCCTTACGCCACGCAGTATTGCTCATCATCGACAAAATCCATACGGATGCCC
TGGTATGCCGCACCATTTATCACTACCTTAGTCTTCATTTGATCATGATATAGTAGAATCCCCTTATTTAACGGGCTTTA
CCATGTCGTATTCTATCGGCGAATTTGCCAGACTATGCGGTATCAATGCCGCCACGCTAAGGGCATGGCAGCGACGCTAT
G

FIG. 22A

sseA

ATGATGATAAAGAAAAAGGCTGCGTTTAGTGAATATCGTGATTTAGAGCAAAGTTACATGCAGCTAAATCACTGTCTTAA
AAAATTTCACCAAATCCGGGCTAAGGTGAGTCAACAGCTTGCTGAAAGGGCAGAGAGCCCCAAAAATAGCAGAGAGACAG
AGAGTATTCTTCATAACCTATTTCCACAAGGCGTTGCCGGGGTTAACCAGGAGGCCGAGAAGGATTTAAAGAAAATAGTA
AGTTTGTTTAAACAACTTGAAGTACGACTGAAACAACTTAATGCTCAAGCCCCGGTGGAGATACCGTCAGGAAAAACAAA
AAGGTAA

FIG. 22B

sseB

ATGTCTTCAGGAAACATCTTATGGGGAAGTCAAAACCCTATTGTGTTTAAAAATAGCTTCGGCGTCAGCAACGCTGATAC
CGGGAGCCAGGATGACTTATCCCAGCAAAATCCGTTTGCCGAAGGGTATGGTGTTTTGCTTATTCTCCTTATGGTTATTC
AGGCTATCGCAAATAATAAATTTATTGAAGTCCAGAAGAACGCTGAACGTGCCAGAAATACCCAGGAAAAGTCAAATGAG
ATGGATGAGGTGATTGCTAAAGCAGCCAAAGGGGATGCTAAAACCAAAGAGGAGGTGCCTGAGGATGTAATTAAATACAT
GCGTGATAATGGTATTCTCATCGATGGTATGACCATTGATGATTATATGGCTAAATATGGCGATCATGGGAAGCTGGATA
AAGGTGGCCTACAGGCGATCAAAGCGGCTTTGGATAATGACGCCAACCGGAATACCGATCTTATGAGTCAGGGGCAGATA
ACAATTCAAAAAATGTCTCAGGAGCTTAACGCTGTCCTTACCCAACTGACAGGGCTTATCAGTAAGTGGGGGGAAATTTC
CAGTATGATAGCGCAGAAAACGTACTCATGA

FIG. 22C

sseC

ATGAATCGAATTCACAGTAATAGCGACAGCGCCGCAGGAGTAACCGCCTTAACACATCATCACTTAAGCAATGTCAGTTG
CGTTTCCTCGGGTTCGCTGGGAAAGCGCCAGCATCGTGTGAATTCTACTTTTGGCGATGGCAACGCCGCGTGTCTGCTAT
CCGGGAAAATTAGTCTTCAGGAGGCAAGCAATGCGTTGAAGCAACTGCTTGATGCCGTACCCGGAAATCATAAGCGTCCA
TCATTGCCTGACTTTTTGCAGACCAATCCCGCGGTTTTATCAATGATGATGACGTCATTAATACTCAACGTCTTTGGTAA
TAACGCTCAATCGTTATGCCAACAGCTTGAGCGGGCAACTGAGGTGCAAAATGCATTACGTAATAAGCAGGTAAAGGAGT
ATCAGGAGCAGATCCAGAAAGCGATAGAGCAGGAGGATAAAGCGCGTAAAGCGGGTATTTTTGGCGCTATTTTTGACTGG
ATTACCGGCATATTTGAAACCGTGATTGGCGCCTTAAAAGTTGTGGAAGGTTTTCTGTCCGGAAATCCCGCAGAAATGGC
TAGCGGCGTAGCTTATATGGCCGCAGGTTGTGCAGGAATGGTTAAAGCCGGAGCCGAAACGGCAATGATGTGCGGTGCTG
ACCACGATACCTGTCAGGCAATTATTGACGTGACAAGTAAGATTCAATTTGGTTGTGAAGCCGTCGCGCTGGCACTGGAT
GTTTTCCAGATTGGCCGTGCTTTTATGGCGACGAGAGGTTTATCTGGCGCAGCTGCAAAAGTGCTTGACTCCGGTTTTGG
CGAGGAAGTGGTTGAGCGTATGGTAGGTGCAGGGGAAGCAGAAATAGAGGAGTTGGCTGAAAAGTTTGGCGAAGAAGTGA
GCGAAAGTTTTTCCAAACAATTTGAGCCGCTTGAACGTGAAATGGCTATGGCGAATGAGATGGCAGAGGAGGCTGCCGAG
TTTTCTCGTAACGTAGAAAATAATATGACGCGAAGCGCGGGAAAAAGCTTTACGAAAGAGGGGGTGAAAGCCATGGCAAA
AGAAGCGGCAAAAGAAGCCCTGGAAAAATGTGTGCAAGAAGGTGGAAAGTTCCTGTTAAAAAAATTCCGTAATAAAGTTC
TCTTCAATATGTTCAAAAAAATCCTGTATGCCTTACTGAGGGATTGTTCATTTAAAGGCTTACAGGCTATCAGATGTGCA
ACCGAGGGCGCCAGTCAGATGAATACTGGCATGGTTAACACAGAAAAAGCGAAGATCGAAAAGAAAATAGAGCAATTAAT
AACTCAGCAACGGTTTCTGGATTTCATAATGCAACAAACAGAAAACCAGAAAAAGATAGAACAAAAACGCTTAGAGGAGC
TTTATAAGGGGACGGGTGCCGCGCTTAGAGATGTATTAGATACCATTGATCACTATAGTAGCGTTCAGGCGAGAATAGCT
GGCTATCGCGCTTAA

FIG. 22D

sseD

ATGGGTACTGAATCAATGCTTCTGTTATTTGATGATATCTGGATGAAGCTAATGGAGCTTGCCAAAAAGCTGCGCGATAT
CATGCGCAGCTATAACGTAGAAAAACAACGGCTGGCCTGGGAACTGCAAGTCAATGTTTTACAGACGCAAATGAAAACAA
TTGATGAAGCGTTTAGAGCATCAATGATTACTGCGGGTGGCGCAATGTTGTCGGGTGTACTGACGATAGGATTAGGGGCC
GTAGGCGGGGAAACCGGTCTTATAGCGGGTCAAGCCGTAGGCCACACAGCTGGGGGCGTCATGGGCCTGGGGGCTGGTGT
AGCGCAACGTCAAAGTGATCAAGATAAAGCGATTGCCGACCTGCAACAAAATGGGGCCCAATCTTATAATAAATCCCTGA
CGGAAATTATGGAGAAAGCAACTGAAATTATGCAGCAAATCATCGGCGTGGGGTCGTCACTGGTCACGGTTCTTGCTGAA
ATACTCCGGGCATTAACGAGGTAA

FIG. 22E

sseE

ATGGTGCAAGAAATAGAGCAATGGTTACGTCGGCATCAGGTGTTTACTGAGCCTGCATATTTAGGGGAGACCGCCATATT
ACTTGGGCAGCAGTTTATATTATCGCCTTACCTGGTGATCTATCGTATTGAGGCAAAAGAAATGATTATTTGTGAGTTCA
GGCGCCTGACGCCCGGGCAACCTCGACCACAGCAATTGTTTCACTTACTGGGACTTTTACGCGGGATATTTGTGCATCAC
CCGCAGTTAACATGTTTAAAGATGTTGATAATCACCGACGTTCTGGATGAAAAAAAAGCCATGCTACGCAGGAAATTATT
GCGCATCCTGACAGTAATGGGAGCGACCTTTACACAGCTTGATGGCGATAACTGGACAGTTTTATCCGCCGAGCATCTTA
TCCAGCGACGTTTTTAA

FIG. 22F

sseF

ATGAAAATTCATATTCCGTCAGCGGCAAGTAATATAGTCGATGGTAATAGTCCTCCTTCCGATATACAAGCGAAGGAGGT
ATCGTTTCCTCCCCCTGAAATTCCAGCGCCTGGCACCCCCGCAGCCCCTGTGCTGCTTACGCCTGAACAAATAAGGCAGC
AGAGGGATTATGCGATACATTTTATGCAATACACTATTCGTGCGCTGGGTGCGACAGTCGTGTTTGGGTTATCGGTTGCT
GCAGCGGTAATTTCTGGCGGGGCAGGATTACCCATTGCTATTCTTGCGGGGGCGGCGCTCGTGATTGCTATTGGGGATGC
TTGCTGTGCGTATCATAATTATCAATCGATATGTCAGCAAAAGGAGCCATTACAAACCGCCAGTGATAGCGTTGCTCTTG
TGGTCAGTGCGCTGGCCTTAAAATGTGGGGCAAGTCTTAACTGCGCTAACACCCTTGCTAATTGTCTTTCTTTATTAATA
CGTTCAGGAATCGCTATTTCTATGTTGGTTTTACCCCTACAGTTTCCACTGCCCGCGGCTGAAAATATTGCGGCCTCTTT
GGACATGGGGAGTGTAATTACCTCCGTTAGCCTGACGGCGATAGGTGCGGTACTGGATTATTGCCTTGCCCGCCCCTCTG
GCGACGATCAGGAAAATTCTGTTGATGAACTTCATGCCGATCCCAGTGTGTTATTGGCGGAACAAATGGCAGCGCTCTGT
CAATCTGCTACTACACCTGCACCTGCATTAATGGACAGTTCTGATCATACATCTCGGGGAGAACCATGA

FIG. 22G

sseG

ATGAAACCTGTTAGCCCAAATGCTCAGGTAGGAGGGCAACGTCCTGTTAACGCGCCTGAGGAATCACCTCCATGTCCTTC
ATTGCCACATCCGGAAACCAATATGGAGAGTGGTAGAATAGGACCTCAACAAGGAAAAGAGCGGGTATTGGCCGGACTTG
CGAAACGAGTGATAGAGTGTTTTCCAAAAGAAATTTTTAGTTGGCAAACGGTTATTTTGGGCGGACAGATTTTATGCTGT
TCCGCTGGAATAGCATTAACAGTGCTAAGTGGTGGAGGCGCGCCGCTCGTAGCCCTGGCAGGGATTGGCCTTGCTATTGC
CATCGCGGATGTCGCCTGTCTTATCTACCATCATAAACATCATTTGCCTATGGCTCACGACAGTATAGGCAATGCCGTTT
TTTATATTGCTAATTGTTTCGCCAATCAACGCAAAAGTATGGCGATTGCTAAAGCCGTCTCCCTGGGCGGTAGATTAGCC
TTAACCGCGACGGTAATGACTCATTCATACTGGAGTGGTAGTTTGGGACTACAGCCTCATTTATTAGAGCGTCTTAATGA
TATTACCTATGGACTAATGAGTTTTACTCGCTTCGGTATGGATGGGATGGCAATGACCGGTATGCAGGTCAGCAGCCCAT
TATATCGTTTGCTGGCTCAGGTAACGCCAGAACAACGTGCGCCGGAGTAA

FIG. 22H

sscA

ATGAAAAAAGACCCGACCCTACAACAGGCACATGACACGATGCGGTTTTTCCGGCGTGGCGGCTCGCTGCGTATGTTGTT
GGATGACGATGTTACACAGCCGCTTAATACTCTGTATCGCTATGCCACGCAGCTTATGGAGGTAAAAGAATTCGCCGGCG
CAGCGCGACTTTTTCAATTGCTGACGATATATGATGCCTGGTCATTTGACTACTGGTTTCGGTTAGGGGAATGCTGCCAG
GCTCAAAAACATTGGGGGGAAGCGATATACGCTTATGGACGCGCGGCACAAATTAAGATTGATGCGCCGCAGGCGCCATG
GGCCGCAGCGGAATGCTATCTCGCGTGTGATAACGTCTGTTATGCAATCAAAGCGTTAAAGGCCGTGGTGCGTATTTGCG
GCGAGGTCAGTGAACATCAAATTCTCCGACAGCGTGCAGAAAAGATGTTACAGCAACTTTCTGACAGGAGCTAA

FIG. 22I

sscB

ATGATGATGAAAGAAGATCAGAAAAATAAAATACCCGAAGACATTCTGAAACAGCTATTATCCGTTGATCCGGAAACCGT
TTATGCCAGTGGTTACGCCTCATGGCAGGAGGGGGATTATTCGCGCGCCGTAATCGATTTTAGTTGGCTGGTGATGGCCC
AGCCATGGAGTTGGCGTGCCCATATTGCATTGGCTGGCACCTGGATGATGCTTAAAGAATACACGACGGCCATTAATTTC
TATGGACATGCCTTGATGCTGGATGCCAGCCATCCAGAACCGGTTTACCAAACGGGCGTCTGTCTCAAAATGATGGGGGA
ACCCGGGTTGGCGAGAGAGGCTTTTCAAACCGCAATCAAGATGAGTTATGCGGATGCCTCATGGAGTGAGATTCGCCAGA
ATGCGCAAATAATGGTTGATACTCTTATTGCTTAA

FIG. 22J

ssaD

ATGGCATATCTCATGGTTAATCCAAAGAGTTCCTGGAAAATACGTTTTTTAGGTCACGTTTTACAAGGCCGGGAAGTATG
GCTGAATGAAGGTAACCTGTCACTGGGGGAGAAGGGATGCGATATTTGTATTCCGCTGGCTATAAATGAAAAAATTATTC
TGAGAGAACAGGCAGATAGTTTATTTGTTGATGCCGGGAAAGCCAGAGTTAGAGTTAATGGCCGCAGATTTAATCCAAAT
AAGCCGCTACCATCCAGTGGGGTTTTGCAGGTTGCGGGAGTGGCTATCGCGTTTGGTAAACAGGATTGTGAACTTGCTGA
TTATCAAATACCCGTTTCCAGATCAGGGTACTGGTGGTTGGCTGGCGTATTCTTGATTTTCATCGGTGGAATGGGTGTCC
TGTTAAGTATTAGTGGTCAGCCTGAAACGGTAAATGACTTACCTTTGCGGGTTAAGTTTTTATTAGACAAAAGCAATATT
CATTATGTGCGGGCGCAATGGAAAGAAGATGGCAGCCTGCAGTTGTCCGGTTATTGCTCGTCAAGCGAACAGATGCAAAA
GGTGAGAGCGACTCTCGAATCATGGGGGGTCATGTATCGGGATGGTGTAATCTGTGATGACTTATTGGTACGAGAAGTGC
AGGATGTTTTGATAAAAATGGGTTACCCGCATGCTGAAGTATCCAGCGAAGGGCCGGGGAGCGTGTTAATTCATGATGAT
ATACAAATGGATCAGCAATGGCGCAAGGTTCAACCATTACTTGCAGATATTCCCGGGTTATTGCACTGGCAGATTAGTCA
CTCTCATCAGTCTCAGGGGGATGATATTATTTCTGCGATAATAGAGAACGGTTTAGTGGGGCTTGTCAATGTTAGCCCAA
TGCGGCGCTCTTTTGTTATCAGTGGTGTACTGGATGAATCTCATCAACGCATTTTGCAAGAAACGTTAGCAGCATTAAAG
AAAAAGGATCCCGCTCTTTCTTTAATTTATCAGGATATTGCGCCTTCCCATGATGAAAGCAAGTATCTGCCTGCGCCAGT
GGCTGGCTTTGTACAGAGTCGCCATGGTAATTACTTATTACTGACGAATAAAGAGCGTTTACGTGTAGGGGCATTGTTAC
CCAATGGGGGAGAAATTGTCCATCTGAGTGCCGATGTGGTAACGATTAAACATTATGATACTTTGATTAACTATCCATTA
GATTTTAAGTGA

FIG. 22K

ssaE

ATGACAACTTTGACCCGGTTAGAAGATTTGCTGCTTCATTCGCGTGAAGAGGCCAAAGGCATAATTTTACAATTAAGGGC
TGCCCGGAAACAGTTAGAAGAGAACAACGGCAAGTTACAGGATCCGCAGCAATATCAGCAAAACACCTTATTGCTTGAAG
CGATCGAGCAGGCCGAAAATATCATCAACATTATTTATTATCGTTACCATAACAGCGCACTTGTAGTGAGTGAGCAAGAG
TAA

FIG. 22L

ssaG

ATGGATATTGCACAATTAGTGGATATGCTCTCCCACATGGCGCACCAGGCAGGCCAGGCCATTAATGACAAAATGAATGG
TAATGATTTGCTCAACCCAGAATCGATGATTAAAGCGCAATTTGCCTTACAGCAGTATTCTACATTTATTAATTACGAAA
GTTCACTGATCAAAATGATCAAGGATATGCTTAGTGGAATCATTGCTAAAATCTGA

FIG. 22M

ssaH

ATGTTTGCGGGCGTTAACCATAGCCTGATTTCCCAGGTACATGCGATGTTACCAGCGCTAACGGTTATTGTTCCGGATAA
AAAATTACAGTTGGTATGTCTGGCATTATTGTTGGCGGGTTTAAATGAGCCGCTAAAAGCCGCGAAAATTTTATCGGATA
TAGATTTGCCAGAGGCTATGGCGCTGCGTCTGTTATTTCCTGCACCAAATGAGGGGTTTGAAAATTGA

FIG. 22N

ssaI

ATGAGCGTAGTGCCTGTAAGCACTCAATCTTATGTAAAGTCCTCTGCAGAACCGAGCCAGGAGCAAATTAATTTTTTTGA
ACAATTGCTGAAAGATGAAGCATCCACCAGTAACGCCAGTGCTTTATTACCGCAGGTTATGTTGACCAGACAAATGGATT
ATATGCAGTTAACGGTAGGCGTCGATTATCTTGCCAGAATATCAGGCGCAGCATCGCAAGCGCTTAATAAGCTGGATAAC
ATGGCATGA

FIG. 22O

ssaJ

ATGAAGGTTCATCGTATAGTATTTCTTACTGTCCTTACGTTCTTTCTTACGGCATGTGATGTGGATCTTTATCGCTCATT
GCCAGAAGATGAAGCGAATCAAATGCTGGCATTACTTATGCAGCATCATATTGATGCGGAAAAAAAACAGGAAGAGGATG
GTGTAACCTTACGTGTCGAGCAGTCGCAGTTTATTAATGCGGTTGAGCTACTTAGACTTAACGGTTATCCGCATAGGCAG
TTTACAACGGCGGATAAGATGTTTCCGGCTAATCAGTTAGTGGTATCACCCCAGGAAGAACAGCAGAAGATTAATTTTTT
AAAAGAACAAAGAATTGAAGGAATGCTGAGTCAGATGGAGGGCGTGATTAATGCAAAAGTGACCATTGCGCTACCGACTT
ATGATGAGGGAAGTAACGCTTCTCCGAGCTCAGTTGCCGTATTTATAAAATATTCACCTCAGGTCAATATGGAGGCCTTT
CGGGTAAAAATTAAAGATTTAATAGAGATGTCAATCCCTGGGTTGCAATACAGTAAGATTAGTATCTTGATGCAGCCTGC
TGAATTCAGAATGGTAGCTGACGTACCCGCGAGACAAACATTCTGGATTATGGACGTTATCAACGCCAATAAAGGGAAGG
TGGTGAAGTGGTTGATGAAATACCCTTATCCGTTGATGTTATCGTTGACAGGACTGTTATTAGGAGTGGGCATCCTGATC
GGCTATTTTTGCCTGAGACGCCGTTTTTGA

FIG. 22P

ssrA

ATGAATTTGCTCAATCTCAAGAATACGCTGCAAACATCTTTAGTAATCAGGCTAACTTTTTTATTTTTATTAACAACAAT
AATTATTTGGCTGCTATCTGTGCTTACCGCAGCTTATATATCAATGGTTCAGAAACGGCAGCATATAATAGAGGATTTAT
CCGTTCTATCCGAGATGAATATTGTACTAAGCAATCAACGGTTTGAAGAAGCTGAACGTGACGCTAAAAATTTAATGTAT
CAATGCTCATTAGCGACTGAGATTCATCATAACGATATTTTCCCTGAGGTGAGCCGGCATCTATCTGTCGGTCCTTCAAA
TTGCACGCCGACGCTAAACGGAGAGAAGCACCGTCTCTTTCTGCAGTCCTCTGATATCGATGAAAATAGCTTTCGTCGCG
ATAGTTTTATTCTTAATCATAAAAATGAGATTTCGTTATTATCTACTGATAACCCTTCAGATTATTCAACTCTACAGCCT
TTAACGCGAAAAAGCTTTCCTTTATACCCAACCCATGCCGGGTTTTACTGGAGTGAACCAGAATACATAAACGGCAAAGG
ATGGCACGCTTCCGTTGCGGTTGCCGATCAGCAAGGCGTATTTTTTGAGGTGACGGTTAAACTTCCCGATCTCATTACTA
AGAGCCACCTGCCATTAGATGATAGTATTCGAGTATGGCTGGATCAAAACAACCACTTATTGCCGTTTTCATACATCCCG
CAAAAAATACGTACACAGTTAGAAAATGTAACGCTGCATGATGGATGGCAGCAAATTCCCGGATTTCTGATATTACGCAC
AACCTTGCATGGCCCCGGATGGAGTCTGGTTACGCTGTACCCATACGGTAATCTACATAATCGCATCTTAAAAATTATCC
TTCAACAAATCCCCTTTACATTAACAGCATTGGTGTTGATGACGTCGGCTTTTTGCTGGTTACTACATCGCTCACTGGCC
AAACCGTTATGGCGTTTTGTCGATGTCATTAATAAAACCGCAACTGCACCGCTGAGCACACGTTTACCAGCACAACGACT
GGATGAATTAGATAGTATTGCCGGTGCTTTTAACCAACTGCTTGATACTCTACAAGTCCAATACGACAATCTGGAAAACA
AAGTCGCAGAGCGCACCCAGGCGCTAAATGAAGCAAAAAAACGCGCTGAGCGAGCTAACAAACGTAAAAGCATTCATCTT
ACGGTAATAAGTCATGAGTTACGTACTCCGATGAATGGCGTACTCGGTGCAATTGAATTATTACAAACCACCCCTTTAAA
CATAGAGCAACAAGGATTAGCTGATACCGCCAGAAATTGTACACTGTCTTTGTTAGCTATTATTAATAATCTGCTGGATT
TTTCACGCATCGAGTCTGGTCATTTCACATTACATATGGAAGAAACAGCGTTACTGCCGTTACTGGACCAGGCAATGCAA
ACCATCCAGGGGCCAGCGCAAAGCAAAAAACTGTCATTACGTACTTTTGTCGGTCAACATGTCCCTCTCTATTTTCATAC
CGACAGTATCCGTTTACGGCAAATTTTGGTTAATTTACTCGGGAACGCGGTAAAATTTACCGAAACCGGAGGGATACGTC
TGACGGTCAAGCGTCATGAGGAACAATTAATATTTCTGGTTAGCGATAGCGGTAAAGGGATTGAAATACAGCAGCAGTCT
CAAATCTTTACTGCTTTTTATCAAGCAGACACAAATTCGCAAGGTACAGGAATTGGACTGACTATTGCGTCAAGCCTGGC
TAAAATGATGGGCGGTAATCTGACACTAAAAAGTGTCCCCGGGGTTGGAACCTGTGTCTCGCTAGTATTACCCTTACAAG
AATACCAGCCGCCTCAACCAATTAAAGGGACGCTGTCAGCGCCGTTCTGCCTGCATCGGCAACTGGCTTGCTGGGGAATA
CGCGGTGAACCACCCCACCAGCAAAATGCGCTTCTCAACGCAGAGCTTTTGTATTTCTCCGGAAAACTCTACGACCTGGC
GCAACAGTTAATATTGTGTACACCAAATATGCCAGTAATAAATAATTTGTTACCACCCTGGCAGTTGCAGATTCTTTTGG
TTGATGATGCCGATATTAATCGGGATATCATCGGCAAAATGCTTGTCAGCCTGGGCCAACACGTCACTATTGCCGCCAGT
AGTAACGAGGCTCTGACTTTATCACAACAGCAGCGATTCGATTTAGTACTGATTGACATTAGAATGCCAGAAATAGATGG
TATTGAATGTGTACGATTATGGCATGATGAGCCGAATAATTTAGATCCTGACTGCATGTTTGTGGCACTATCCGCTAGCG
TAGCGACAGAAGATATTCATCGTTGTAAAAAAAATGGGATTCATCATTACATTACAAAACCAGTGACATTGGCTACCTTA
GCTCGCTACATCAGTATTGCCGCAGAATACCAACTTTTACGAAATATAGAGCTACAGGAGCAGGATCCGAGTCGCTGCTC
AGCGCTACTGGCGACAGATGATATGGTCATTAATAGCAAGATTTTCCAATCACTGGACCTCTTGCTGGCTGATATTGAAA
ATGCCGTATCGGCTGGAGAAAAAATCGATCAGTTAATTCACACATTAAAAGGCTGTTTAGGTCAAATAGGGCAGACTGAA
TTGGTATGCTATGTCATAGACATTGAGAATCGCGTAAAAATGGGGAAAATCATCGCGCTGGAGGAACTAACCGACTTACG
CCAGAAAATACGTATGATCTTCAAAAACTACACCATTACTTAA

FIG. 22Q

ssrB

ATGAAAGAATATAAGATCTTATTAGTAGACGATCATGAAATCATCATTAACGGCATTATGAATGCCTTATTACCCTGGCC
TCATTTTAAAATTGTAGAGCATGTTAAAAATGGTCTTGAGGTTTATAATGCCTGTTGTGCATACGAGCCTGACATACTTA
TCCTTGATCTTAGTCTACCTGGCATCAATGGCCTGGATATCATTCCTCAATTACATCAGCGTTGGCCAGCAATGAATATT
CTGGTTTACACAGCATACCAACAAGAGTATATGACCATTAAAACTTTAGCCGCAGGTGCTAATGGCTATGTTTTAAAAAG
CAGTAGTCAGCAAGTTCTGTTAGCGGCATTGCAAACAGTAGCAGTAAACAAGCGTTACATTGACCCAACGTTGAATCGGG
AAGCTATCCTGGCTGAATTAAACGCTGACACGACCAATCATCAACTGCTTACTTTGCGCGAGCGTCAGGTTCTTAAACTT
ATTGACGAGGGGTATACCAATCATGGGATCAGCGAAAAGCTACATATCAGTATAAAAACCGTCGAAACACACCGGATGAA
TATGATGAGAAAGCTACAGGTTCATAAAGTGACAGAGTTACTTAACTGTGCCCGAAGAATGAGGTTAATAGAGTATTAA

FIG. 23A

SseA

MMIKKKAAFSEYRDLEQSYMQLNHCLKKFHQIRAKVSQQLAERAESPKNSRETESILHNLFPQGVAGVNQEAEKDLKKIV
SLFKQLEVRLKQLNAQAPVEIPSGKTKR

FIG. 23B

SseB
MSSGNILWGSQNPIVFKNSFGVSNADTGSQDDLSQQNPFAEGYGVLLILLMVIQAIANNKFIEVQKNAERARNTQEKSNE
MDEVIAKAAKGDAKTKEEVPEDVIKYMRDNGILIDGMTIDDYMAKYGDHGKLDKGGLQAIKAALDNDANRNTDLMSQGQI
TIQKMSQELNAVLTQLTGLISKWGEISSMIAQKTYS

FIG. 23C

SseC
MNRIHSNSDSAAGVTALTHHHLSNVSCVSSGSLGKRQHRVNSTFGDGNAACLLSGKISLQEASNALKQLLDAVPGNHKRP
SLPDFLQTNPAVLSMMMTSLILNVFGNNAQSLCQQLERATEVQNALRNKQVKEYQEQIQKAIEQEDKARKAGIFGAIFDW
ITGIFETVIGALKVVEGFLSGNPAEMASGVAYMAAGCAGMVKAGAETAMMCGADHDTCQAIIDVTSKIQFGCEAVALALD
VFQIGRAFMATRGLSGAAAKVLDSGFGEEVVERMVGAGEAEIEELAEKFGEEVSESFSKQFEPLEREMAMANEMAEEAAE
FSRNVENNMTRSAGKSFTKEGVKAMAKEAAKEALEKCVQEGGKFLLKKFRNKVLFNMFKKILYALLRDCSFKGLQAIRCA
TEGASQMNTGMVNTEKAKIEKKIEQLITQQRFLDFIMQQTENQKKIEQKRLEELYKGTGAALRDVLDTIDHYSSVQARIA
GYRA

FIG. 23D

SseD
MEASNVALVLPAPSLLTPSSTPSPSGEGMGTESMLLLFDDIWMKLMELAKKLRDIMRSYNVEKQRLAWELQVNVLQTQMK
TIDEAFRASMITAGGAMLSGVLTIGLGAVGGETGLIAGQAVGHTAGGVMGLGAGVAQRQSDQDKAIADLQQNGAQSYNKS
LTEIMEKATEIMQQIIGVGSSLVTVLAEILRALTR

FIG. 23E

SseE
MVQEIEQWLRRHQVFTEPAYLGETAILLGQQFILSPYLVIYRIEAKEMIICEFRRLTPGQPRPQQLFHLLGLLRGIFVHH
PQLTCLKMLIITDVLDEKKAMLRRKLLRILTVMGATFTQLDGDNWTVLSAEHLIQRRF

FIG. 23F

SseF
MKIHIPSAASNIVDGNSPPSDIQAKEVSFPPPEIPAPGTPAAPVLLTPEQIRQQRDYAIHFMQYTIRALGATVVFGLSVA
AAVISGGAGLPIAILAGAALVIAIGDACCAYHNYQSICQQKEPLQTASDSVALVVSALALKCGASLNCANTLANCLSLLI
RSGIAISMLVLPLQFPLPAAENIAASLDMGSVITSVSLTAIGAVLDYCLARPSGDDQENSVDELHADPSVLLAEQMAALC
QSATTPAPALMDSSDHTSRGEP

FIG. 23G

SseG
MKPVSPNAQVGGQRPVNAPEESPPCPSLPHPETNMESGRIGPQQGKERVLAGLAKRVIECFPKEIFSWQTVILGGQILCC
SAGIALTVLSGGGAPLVALAGIGLAIAIADVACLIYHHKHHLPMAHDSIGNAVFYIANCFANQRKSMAIAKAVSLGGRLA
LTATVMTHSYWSGSLGLQPHLLERLNDITYGLMSFTRFGMDGMAMTGMQVSSPLYRLLAQVTPEQRAPE

FIG. 23H

SscA
MKKDPTLQQAHDTMRFFRRGGSLRMLLDDDVTQPLNTLYRYATQLMEVKEFAGAARLFQLLTIYDAWSFDYWFRLGECCQ
AQKHWGEAIYAYGRAAQIKIDAPQAPWAAAECYLACDNVCYAIKALKAVVRICGEVSEHQILRQRAEKMLQQLSDRS

FIG. 23I

SscB
MMMKEDQKNKIPEDILKQLLSVDPETVYASGYASWQEGDYSRAVIDFSWLVMAQPWSWRAHIALAGTWMMLKEYTTAINF
YGHALMLDASHPEPVYQTGVCLKMMGEPGLAREAFQTAIKMSYADASWSEIRQNAQIMVDTLIA

FIG. 23J

SsaD
MAYLMVNPKSSWKIRFLGHVLQGREVWLNEGNLSLGEKGCDICIPLAINEKIILREQADSLFVDAGKARVRVNGRRFNPN
KPLPSSGVLQVAGVAIAFGKQDCELADYQIPVSRSGYWWLAGVFLIFIGGMGVLLSISGQPETVNDLPLRVKFLLDKSNI
HYVRAQWKEDGSLQLSGYCSSSEQMQKVRATLESWGVMYRDGVICDDLLVREVQDVLIKMGYPHAEVSSEGPGSVLIHDD
IQMDQQWRKVQPLLADIPGLLHWQISHSHQSQGDDIISAIIENGLVGLVNVSPMRRSFVISGVLDESHQRILQETLAALK
KKDPALSLIYQDIAPSHDESKYLPAPVAGFVQSRHGNYLLLTNKERLRVGALLPNGGEIVHLSADVVTIKHYDTLINYPL
DFK

FIG. 23K

SsaE
MTTLTRLEDLLLHSREEAKGIILQLRAARKQLEENNGKLQDPQQYQQNTLLLEAIEQAENIINIIYYRYHNSALVVSEQE

FIG. 23L

SsaG
MDIAQLVDMLSHMAHQAGQAINDKMNGNDLLNPESMIKAQFALQQYSTFINYESSLIKMIKDMLSGIIAKI

FIG. 23M

SsaH
MFAGVNHSLISQVHAMLPALTVIVPDKKLQLVCLALLLAGLNEPLKAAKILSDIDLPEAMALRLLFPAPNEGFEN

FIG. 23N

SsaI
MSVVPVSTQSYVKSSAEPSQEQINFFEQLLKDEASTSNASALLPQVMLTRQMDYMQLTVGVDYLARISGAASQALNKLDN
MA

FIG. 23O

SsaJ
MKVHRIVFLTVLTFFLTACDVDLYRSLPEDEANQMLALLMQHHIDAEKKQEEDGVTLRVEQSQFINAVELLRLNGYPHRQ
FTTADKMFPANQLVVSPQEEQQKINFLKEQRIEGMLSQMEGVINAKVTIALPTYDEGSNASPSSVAVFIKYSPQVNMEAF
RVKIKDLIEMSIPGLQYSKISILMQPAEFRMVADVPARQTFWIMDVINANKGKVVKWLMKYPYPLMLSLTGLLLGVGILI
GYFCLRRRF

FIG. 23P

SsrA
MNLLNLKNTLQTSLVIRLTFLFLLTTIIIWLLSVLTAAYISMVQKRQHIIEDLSVLSEMNIVLSNQRFEEAERDAKNLMY
QCSLATEIHHNDIFPEVSRHLSVGPSNCTPTLNGEKHRLFLQSSDIDENSFRRDSFILNHKNEISLLSTDNPSDYSTLQP
LTRKSFPLYPTHAGFYWSEPEYINGKGWHASVAVADQQGVFFEVTVKLPDLITKSHLPLDDSIRVWLDQNNHLLPFSYIP
QKIRTQLENVTLHDGWQQIPGFLILRTTLHGPGWSLVTLYPYGNLHNRILKIILQQIPFTLTALVLMTSAFCWLLHRSLA
KPLWRFVDVINKTATAPLSTRLPAQRLDELDSIAGAFNQLLDTLQVQYDNLENKVAERTQALNEAKKRAERANKRKSIHL
TVISHELRTPMNGVLGAIELLQTTPLNIEQQGLADTARNCTLSLLAIINNLLDFSRIESGHFTLHMEETALLPLLDQAMQ
TIQGPAQSKKLSLRTFVGQHVPLYFHTDSIRLRQILVNLLGNAVKFTETGGIRLTVKRHEEQLIFLVSDSGKGIEIQQQS
QIFTAFYQADTNSQGTGIGLTIASSLAKMMGGNLTLKSVPGVGTCVSLVLPLQEYQPPQPIKGTLSAPFCLHRQLACWGI
RGEPPHQQNALLNAELLYFSGKLYDLAQQLILCTPNMPVINNLLPPWQLQILLVDDADINRDIIGKMLVSLGQHVTIAAS
SNEALTLSQQQRFDLVLIDIRMPEIDGIECVRLWHDEPNNLDPDCMFVALSASVATEDIHRCKKNGIHHYITKPVTLATL
ARYISIAAEYQLLRNIELQEQDPSRCSALLATDDMVINSKIFQSLDLLLADIENAVSAGEKIDQLIHTLKGCLGQIGQTE
LVCYVIDIENRVKMGKIIALEELTDLRQKIRMIFKNYTIT

FIG. 23Q

SsrB
MKEYKILLVDDHEIIINGIMNALLPWPHFKIVEHVKNGLEVYNACCAYEPDILILDLSLPGINGLDIIPQLHQRWPAMNI
LVYTAYQQEYMTIKTLAAGANGYVLKSSSQQVLLAALQTVAVNKRYIDPTLNREAILAELNADTTNHQLLTLRERQVLKL
IDEGYTNHGISEKLHISIKTVETHRMNMMRKLQVHKVTELLNCARRMRLIEY

FIG. 24A

Promoter A2
GCTTCCCTCCAGTTGCCTGTTGCAAAATCTTTGGCACTTGATCACTATCGCAGTACATATAGTTTCATCAGAAGATTAAT
CGATGGTGTTATCATTAGGAAGATAAATTTCTTCATATATAACCCAGTCGATGACTACAATTACTTTTTAATAAGATGGC
GATGTAAAAACATCGTAACAGTTTATTTAATAAATAATTTTTCAAATTGTAAGTTTTTATGTCAATGCTGAAAATGTAAT
TGTGAATTTATCGGAAAATCCGAATGATAGAATCGCCTGTGACAAGGTATATGTAGACAGCATCCTGATATTGTACAAGA
AGAGATAGTCGAAATAAATGTGAATCAGGCTTTTTACGGATGTGGTTGTGAGCGAATTTGATAGAAAC

FIG. 24B

Promoter B
TAAAAATATCTTAGAGCCTATCCCACCAGGCGTTAATTGGCGCAGCCAGTTTGGACACGGATAGCGCGCAAAAACCGCAG
CGTACACGTAGTACGTGAGGTTTGACTCGCTACGCTCGCCCTTCGGGCCGCCGCTAGCGGCGTTCAAAACGCTAACGCGT
TTTGGCGAGCACTGCCCAGGTTCAAAATGGCAAGTAAAATAGCCTAATGGGATAGGCTCTTAGTTAGCACGTTAATTATC
TATCGTGTATATGGAGGGGAAT